FC1175 - 2023 - G - 288

RECEIVED 2023 MAY 2 5:22 PM

GOVERNMENT OF THE DISTRICT OF COLUMBIA
OFFICE OF THE ATTORNEY GENERAL

BRIAN L. SCHWALB
ATTORNEY GENERAL

Public Advocacy Division
Social Justice Section

E-Docketed

May 2, 2023

Ms. Brinda Westbrook-Sedgwick
Secretary of the Public Service Commission
of the District of Columbia
1325 G Street, N.W., Suite # 800
Washington, DC 20005

Re: Formal Case No. 1175 – In the Matter of the Washington Gas Light Company's Application for Approval of ProjectPipes 3 Plan.

Dear Ms. Westbrook-Sedgwick:

On behalf of the Department of Energy and Environment, I enclose for filing their Initial Comments on Washington Gas Light Company's ProjectPipes 3 Application that were prepared with the assistant of Synapse Energy Economics, Inc. If you have any questions regarding this filing, please contact the undersigned.

Sincerely,

BRIAN L. SCHWALB
Attorney General

By: */s/ Brian R. Caldwell*
BRIAN R. CALDWELL
Assistant Attorney General
(202) 727-6211 – Direct
Brian.caldwell@dc.gov

cc: Service List

FORMAL CASE NO. 1175

COMMENTS OF THE DISTRICT DEPARTMENT OF TRANSPORTATION

I. Introduction

The Department of Energy and Environment (DOEE), with the assistance of Synapse Energy Economics, respectfully provides these comments to the District of Columbia's Public Service Commission (PSC) for consideration.

Washington Gas Light's (WGL or Company) PROJECT*pipes* program has a laudable goal: "enhance the safety and improve the reliability of Washington Gas's natural gas distribution system by accelerating the replacement of relatively higher-risk natural gas facilities that serve the Company's District of Columbia customers."[1] Yet WGL's application is not designed to maximize safety improvements for the dollars spent. As we discuss herein, the utility does not prioritize replacement of pipe that is actively leaking, nor does it consider repair rather than replacement, a much less costly alternative that can provide substantial safety benefits.

The Company also entirely fails to adequately acknowledge the impact of the District's decarbonization plans on its program. The District of Columbia's plans and policies call clearly for a move away from natural gas toward electrification of end uses. If approved as proposed, the PSC risks the imposition of untenably high gas rates and increased difficulty in mitigating stranded asset costs, which will burden ratepayers for decades into the future. These risks and costs can be mitigated through a strategic approach that truly optimizes the program to reduce safety risk and prepare for a future with significantly less natural gas usage in the District of Columbia.

At minimum, these comments illuminate the fact that acceptance of WGL's application at face value would be an extreme disservice to WGL's captive ratepayers. Rather, the complex and important issues stemming from this application require further analysis and discussion through a fully litigated proceeding. Stakeholders should be afforded the opportunity of fact-finding and more in-depth analysis to fully vet the utility's proposal and provide more optimal alternatives based on record evidence. We urge the Commission to both acknowledge that the utility's status quo approach to its operations and business is no longer tenable given the District's climate goals, *and* to reform this troubled PROJECT*pipes* program to be in the public interest from a safety, cost, and environmental perspective. WGL has no incentive to do this of its own accord.

These comments discuss clear areas of oversight or improvement in PROJECT*pipes* that must be addressed by the PSC through a litigated proceeding:

- Section II discusses the District's decarbonization goals and how the Company's proposal is not aligned with them.

[1] WGL Application, p. 5.

- Section III highlights the very high costs of the program and the likelihood that these costs will make it more difficult to mitigate stranded asset costs.
- Section IV discusses how PROJECT*pipes* does not adequately address safety or greenhouse gas (GHG) reductions.
- Section V addresses the poor performance of PROJECT*pipes* to-date, indicating that a continuation of the program without appropriate safeguards is likely to lead to more of the same.

II. WGL's Application is Inconsistent with the District's Decarbonization Approach

WGL's application is built upon a foundational assumption that the future of the District of Columbia's gas system will be similar to the past—that it is essential to have gas service on every street; that most District of Columbia buildings will be served by gas; and that a large number of ratepayers will continue to pay for the gas system for the indefinite future. If this assumption does not hold, however, it does not make sense to spend $671.8 million over the next five years on proactive pipeline replacement activities, instead of taking a different approach. A new approach would be built on new foundational assumptions: that gas use will decline dramatically; that many customers will not require pipeline gas service; and that only some gas assets will have a long useful life. These new assumptions are consistent with the District of Columbia's stated policies, plans, and pledges, while WGL's assumptions are not.

The District of Columbia Government (DCG or the District) has summarizedit's climate and clean energy policies, especially those components relating to natural gas and electrification, numerous times. These comments draw upon those past comments, and bring them up to date in the context of WGL's present application.

In 2017, Mayor Bowser pledged the District of Columbia would be carbon neutral by 2050. In 2022, the City Council formalized the District's carbon neutrality objective and made it more ambitious, by codifying carbon neutrality by 2045 in the Climate Commitment Act of 2022. Meanwhile, the District's formal plans and policies to achieve these emission reductions have become more ambitious and more concrete regarding the pathway to meet them.

Plans and strategies to achieve District goals

The Clean Energy DC Plan, published in August of 2018, provides a roadmap for the District to reduce GHG emissions within its jurisdiction by 50% below 2006 levels by 2032, while simultaneously increasing renewable energy and reducing energy consumption, putting the District of Columbia on a viable path to achieve complete carbon neutrality by 2050.[2] Clean Energy DC calls for a significant shift away from

[2] The District of Columbia Climate and Energy Action Plan (hereinafter "Clean Energy DC") (August 2018), https://doee.dc.gov/sites/default/files/dc/sites/ddoe/page_content/attachments/Clean%20Energy%20DC%20-

natural gas use in the years prior to 2032 culminating in the eventual end to nearly all fossil fuel use by 2050.

> Achieving the District's 2032 GHG reduction target, or any future targets that are aligned with the Paris Agreement, will require a significant shift away from fossil fuels, including natural gas. Achieving its 2050 GHG carbon neutral target will require the District to eliminate fossil fuel use.[3]

The District's primary strategy to achieve this reduction and gradual elimination of natural gas use is first to shift water and space heating and cooling functions to equipment that does not use fossil fuels.

> To achieve its 2032 GHG target, the District will clearly need to shift away from fossil fuels for buildings (natural gas and fuel oil) and transportation (gasoline and diesel) while simultaneously decarbonizing its electricity supply. For buildings, this will mean shifting to non-fossil fuel sources for heat and hot water.[4]
>
> ....
>
> Consequently, the District must transition away from equipment and technologies that currently depend on such fuels. The equipment used to heat and cool space and water in buildings is a key aspect of this transition.[5]

This transition means that natural gas heating systems in residential and commercial buildings, which can be electrified cost-effectively in many cases, must be converted to electric systems. It also means that new buildings must be designed for electric heating systems rather than those that require the onsite use of fossil fuels: "natural gas and other carbon-intensive heating furnaces can be switched to a low-carbon energy source such as a high-efficiency electricity-based heat pump."[6] DOEE has begun the process to update Clean Energy DC.[7]

Carbon Free DC is the District's strategy to become carbon neutral by 2045.[8] The vision described in Carbon Free DC includes electrification of building heat and cooking:

> **Healthy Heating and Cooling**
>
> Most homes today have gas boilers and furnaces, but these will eventually need to be replaced with all-electric systems that can run on energy generated by renewable sources, such as solar and wind. Electric heat pumps, which are already widely available

%20Full%20Report_0.pdf.

[3] Id., p. 156.

[4] Id., p. 24.

[5] Id., p. 156.

[6] Id., p. 80.

[7] See the Clean Energy DC 2.0 website at https://clean-energy-dc-dcgis.hub.arcgis.com/.

[8] Carbon Free DC, https://storymaps.arcgis.com/stories/034104405ef9462f8e02a49f2bd84fd9#.

> today, can deliver heating and cooling efficiently throughout the year, with zero onsite pollution from burning fossil fuels. In addition, energy recovery ventilators (ERVs) can help reduce heating and cooling loads while maintaining a constant supply of fresh air to occupied areas.
>
> **Safer Kitchens**
>
> Ovens and stove-tops that use gas will need to be replaced with electric systems. Induction units , which heat cookware without a flame or electric resistance coil, are one of the most efficient alternatives to gas stoves and are becoming increasingly common in residential and commercial kitchens alike. Apart from improved efficiency and lower emissions, one of the main benefits of induction units is that the stove-top does not get hot, reducing the risk of burns and other accidents in the kitchen.
>
> **Building-Grid Integration**
>
> In order to fully decarbonize, the District will need to eliminate fossil fuel use in buildings. This means converting systems that currently rely on natural gas and fuel oil (furnaces, boilers, hot water heaters, and kitchen appliances) to electricity. It will also involve demand management and energy storage systems (like batteries), which help improve the reliability of wind and solar power generation. These “building-grid integration” strategies will collectively lead to more than 800,000 metric tons of GHG emissions savings per year by 2050. The District can accelerate the transition to electric systems by ensuring equitable access to enabling products and technologies, such as heat pumps, electric water heaters, induction cooktops, and battery storage systems.

WGL’s application is built upon assumptions that are not consistent with the District’s vision and strategy for achieving carbon neutrality by 2045.

Policies and programs to achieve District goals

The District has established several policies and programs that implement its vision and strategy. These policies and programs address both existing and new (or deeply renovated) buildings.

In existing buildings, the District is driving decarbonization through both standards-based and incentive-based approaches. The Building Energy Performance Standard (BEPS), established by the *Clean Energy DC Omnibus Amendment Act*, and modified by the *Climate Commitment Amendment Act of 2022*, sets binding requirements for both public and private buildings, eventually reaching all buildings of 10,000 square feet or more. The standard applies to site energy use, and electrification through efficiency heat pump technology is a promising and effective way for obligated building owners to meet BEPS requirements. The DC Sustainable Energy Utility (DCSEU) is supporting BEPS compliance as well as offering programs for owners of smaller buildings. Consistent with District policy, the DCSEU has ceased support for natural gas equipment, and increased support for electrification of these systems.[9]

The *Clean Energy DC Building Code Amendment Act of 2022* established an ambitious framework for the District's building code, requiring formal adoption of a building code for net zero construction by the end of 2026. The law's definition of a net zero energy standard requires that "[o]n-site fuel combustion shall not be permitted for the provision of thermal energy to the building" (Section 2(a)(3)(B)(iii)). This law establishes a clear directional signal from the City Council that electrification is the preferred pathway for buildings in the District of Columbia going forward.

Studies and analysis demonstrate the importance of electrification for meeting climate goals

DOEE has also undertaken studies that support its strategy of electrification accompanied by strategic decommissioning of the gas system, and evaluate the impact of this approach on District of Columbia residents.

One recently completed DOEE study is the *Strategic Electrification Roadmap for Buildings and Transportation in the District of Columbia*, which was filed in FC 1167 on April 5, 2023. This roadmap outlines the scope and scale of energy efficiency and electrification measures needed to meet the District's climate targets as delineated in the Clean Energy DC Plan. The study quantified the electric grid impacts of both transportation and building electrification, accompanied by energy efficiency. While overall electric system peak loads do not increase through 2032, and most feeders and substations would not require investment, a fraction of feeders could experience new winter peak loads that exceed their capacity. The study modeled three of these feeders in detail and showed that both straightforward grid investments and non-wires alternatives would be capable of mitigating reliability issues that might develop with greater loads. The roadmap further identified the need to look past 2032 and undertake integrated distribution planning for the greater loads that would accompany full electrification.

DCG also recently filed a report from Gas Safety USA entitled *Strategic Electrification in Washington, D.C.: Neighborhood Case Studies of Transition from Gas to Electric-Based Building Heating* in FC 1167, FC 1154, and FC 1130. (This study is also attached to these comments as "Exhibit 1" due to its direct relevance to WGL's present application.) This report describes analysis that compares the cost and impacts of strategic electrification, along with leak repair rather than pipeline replacement in seven neighborhoods in the District of Columbia. The report shows that, in these locations, the cost of leak repair is approximately 25 times less than pipeline replacement (see Table 1). Focusing on only the highest-emitting leaks can result in further savings.

---

[9] See DCSEU. *A Decade of Transformation: 2021 Annual Report.* p. 17. Available at https://www.dcseu.com/Media/Default/docs/about-us/DCSEU-FY2021AnnualReport-web.pdf.

Table 1. Reproduction of Table 1 from Strategic Electrification in Washington, D.C.: *Neighborhood Case Studies of Transition from Gas to Electric-Based Building Heating*

Table 1. Summary of Neighborhood Streets Case Study Results. Leak rates are in cubic feet per day (CFD); emissions rates are in metric tons (tonnes) per year. Leak repair cost of $5k/leak is estimated from Seavey (2021, p. 48).

Neighborhood streets	Suspected pipe material	No. of leaks/ miles	Leak rate (CFD)	Emissions (CO2e; tonnes/yr)	Est. repair cost	Est. pipeline replacement cost
Brightwood Park	cast iron	9/0.5	665	146	$45K	$1.5M
Capitol Hill	cast iron	6/0.5	356	78	$30K	$1.6M
Columbia Heights	cast iron	7/0.5	556	122	$35K	$1.5M
Deanwood	wrapped steel/ unknown	5/0.4	1150	253	$25K	$1.25M
Greenway	Steel	3/0.3	650	143	$15K	$0.85M
River Terrace	wrapped steel	5/ 0.6	740	162	$25K	$1.9M
Woodridge	Cast iron + wrapped steel	11/0.8	12,100	2660	$55K	$2.6M

The report also shows that a "triage and transition" approach to pipeline repairs can provide a safe and cost-effective means to manage the transition to electrification.

District of Columbia residents have limited funds to support their energy demands and the transition to carbon neutrality. Spending ever-increasing sums on expensive pipeline replacement projects will lead to higher rates and ultimately stranded assets; this is not a reasonable use of ratepayer funds. The study supports the District's strategy of electrification and strategic decommissioning as a safe and cost-effective alternative, while also identiying the important equity benefit that comes from this approach: it mitigates the shifting of unnecessary costs onto customers with the least ability to control and invest in their home's heating future.

III. Adoption of WGL's Proposal Will Result in High Rates and Will Make Mitigating Stranded Cost Risk More Difficult

As detailed in the sections above, WGL's proposal is not designed to minimize costs and maximize safety benefits. Further, as the District decarbonizes in the coming decades through electrification, gas rates will increase due to customers leaving the natural gas system entirely, or significantly reducing gas usage. The Company's plan does not consider this. Indeed, by the time customers have ostensibly left the gas system, WGL's replacement proposal would ensure massive costs remain in the utility's rate base, either leaving any remaining customers to pay exorbitant rates and bills or a massive financial and physical liability that the District or another entity would be forced to absorb. The correct path is clear from both a financial and environmental perspective: costs must be kept to an absolute minimum and gas pipelines must be decommissioned and retired whenever possible in the coming years. This path is contrary to PROJECT*pipes* as proposed by WGL.

PROJECT*pipes* is a high cost program and must be thoroughly scrutinized

The Company proposes to spend $671.8 million[10] in direct costs on its various PROJECT*pipes* initiatives over the next five years. This pace of spending is more than double what was approved for PROJECT*pipes* 2 in 2020: $134 million per year versus $50 million per year for Pipes 2.[11]

Table 2. Washington Gas's Proposed PIPES 3 Distribution Programs[12]

Program Number	Program Description	Program Budget ($M)
1	Bare and/or Unprotected Wrapped Steel Service Replacements	$125.3
2	Bare and/or Unprotected Wrapped Steel Main Replacements (Including Contingent Main and Affected Services)	$98.1
3	Vintage Mechanically Coupled Wrapped Steel Services and Main (Including Contingent Main and Affected Services)	$68.7
4	Cast Iron Main Replacements (Including Contingent Main and Affected Services)	$31.0
5	Copper Services	$13.9
9	Advanced Leak Detection – High Emitter	$2.7
10	Work Compelled by Others (*e.g.,* AOP, PEPCO Capital GRID)	$91.6
11	Work Compelled by DC PLUG	$240.5
Total		**$671.8**

[10] WGL Application, Exh. WG (A)-2, p. 10.

[11] PSC Order No. 20671, p. 53.

[12] See Direct Testimony of Wayne A. Jacas, Exhibit WG (A), Pg. 18-19.

Further, the very high unit (e.g., per mile) cost of many of the programs means they must be very carefully implemented and executed only for the highest risk segments to avoid waste and unnecessary expenditure. In particular, steel main and cast iron main replacement cost $9.8 million and $8.4 million per mile, respectively, according to the Company's estimates.[13]

The proposed costs over the next five years are dwarfed only by what is expected over the next thirty. Just considering cast iron and steel mains replacement, which comprise around 20 percent of proposed project spend over the next five years, WGL estimates over $4 billion[14] to replace remaining pipe over the next several decades. For context, this investment alone represents a 75 percent increase over what is currently in WGL's rate base ($5.3 billion).[15] Inclusion of all programs (such as expenses WGL claims are related to DCPLUG, which has the highest cost estimate of any single program in the Company's application) would mean WGL will ultimately seek costs that will dramatically increase rate base and impose extremely high long-term costs on ratepayers. This will occur in an environment of decreasing gas demand as end uses electrify, further increasing rates.

These direct cost estimates do not incorporate the full revenue requirement that must be paid over time. While revenue requirements are not presented in WGL's testimony, we note that total revenue requirement of capital assets is often double or triple the direct costs. This means the current application would likely impose from $1.3 billion to $2 billion in costs on ratepayers over time while remaining costs will impose at least $8 to $12 billion; the latter is a conservative (low) estimate as we only calculate future costs for two of the PROJECT*pipes* replacement programs.[16] The Commission must grapple with the unsustainability of this program and more robustly consider how to properly balance affordability, safety, and the District's decarbonization plans.

PROJECT*pipes* will make it more difficult to mitigate stranded cost risks

As the District electrifies end uses to meet its climate objectives, the costs cited above will be incorporated into rate base, driving up rates, but over time many of the assets will no longer be "used and useful." The Company's plan ignores this issue. Indeed, WGL's proposal is for the program to continue through 2054 – fully nine years after the District is required to achieve carbon neutrality.[17] Unless WGL changes its approach to depreciation, its 2019 depreciation study proposes depreciating new plastic mains over 55 years[18]—this means WGL, assuming no capital investment occurs from 2054 on, seeks to charge ratepayers for its PROJECT*pipes* program through at least 2109. Shorter book lives

---

[13] WGL Application, Exh. WG (A)-2, pp. 6, 8. Cost per foot estimates converted to cost per mile.

[14] *Ibid.* 2024 dollars. Cost per mile multiplied by remaining miles.

[15] The exact percentage increase will depend on depreciation and the timing of addition to rate base. WGL Quarterly Financial Report, 9/30/22, https://www.washingtongas.com/-/media/00b27018fb584c27a80b7f11b34c66f3.pdf, p. 8.

[16] A fully litigated proceeding, including testimony and hearings, would allow us to calculate more precise estimates.

[17] WGL Application, Exh. WG(A)-2, p. 2.

[18] WGL 2019 Depreciation Rate Study, Formal Case 1137, https://edocket.dcpsc.org/apis/api/Filing/download?attachId=87841&guidFileName=7d36483f-6c42-4ab5-ad27-d11dbb6527ef.pdf. Page 31.

for these assets will make gas service more expensive in the near term, further incentivizing customers to electrify. Who will pay for these costs, and when? This fundamental question is left unanswered by the utility's proposal. With this application and all subsequent, the Commission should seek to reduce costs as much as possible by focusing on leak repair and replacing only the riskiest pipe segments; otherwise, the issue of how to reduce or prevent stranded assets risks becoming entirely intractable.

IV. WGL's Application Emphasizes Spending over Cost-effective Safety Measures

WGL's application for its PROJECT*pipes* 3 Plan is founded on the idea that accelerating the replacement of natural gas pipelines will enhance safety and reliability of its distribution system. In reality, WGL's Application fails to provide a convincing case that it will advance public safety while substantially increasing costs.

WGL prioritizes pipeline replacement instead of more cost-effective repair

WGL's program heavily prioritizes replacement of pipes over repairing pipes with leaks. In WGL's application, the company summarizes the budget for each of its programs. Of the Company's $671.8 million program budgets, only $2.7 million, or 0.4% is dedicated to its Advanced Leak Detection – High Emitter (ALD-HE) program designed to identify high-emitting leaks whenever possible. Even within this program, WGL will make service replacements in lieu of leak repair at their discretion.[19] The remaining programs prioritize pipe replacement to address leaks, though it does not appear they will be based on actual leak data.

As part of the docket for the PROJECT*pipes* 2 Plan, DOEE commissioned the study "Strategic Electrification in Washington, D.C.: Neighborhood Case Studies of Transition From Gas to Electric-based Building Heating," described above and attached to these comments. The study found that the cost of pipeline replacement is on average 25 times the cost of pipeline repair, while having the same impact on emissions. Additionally, repairing pipelines instead of replacing them does not lock the District into continued reliance on fossil fuels and associated infrastructure. By making pipeline retirement a more financially feasible path, repair-based approaches reduce lifetime safety risks. In addition, the savings from repairing pipes rather than replacing them could be spent on electrification in conjunction with managed pipeline retirement.[20] Pipeline retirement through the use of non-pipeline alternatives would further reduce safety risks (as a properly retired pipe presents no safety risk), while advancing Clean Energy DC objectives. While some amount of pipe replacement will be necessary for safety reasons, it should not be the default approach for every segment of gas pipe in the District of Columbia.

---

[19] See Direct Testimony of Ken Hays, Exhibit WG (D), Pg. 5-6.

[20] Gas Safety USA, *Strategic Electrification in Washington, D.C.: Neighborhood Case Studies of Transition from Gas to Electric-Based Building Heating*, submitted in FC 1167, FC 1154, and FC 1130.

Despite the large cost savings that come from repairing leaking pipes rather than replacing them, WGL plans to focus its program on pipeline replacement. Pipeline replacement allows WGL to invest capital costs, on which it earns a rate of return. Pipeline repair, on the other hand, generally incurs operations and maintenance (O&M) costs, which are passed through annually and on which the utility does not earn a rate of return. WGL thus has a clear financial incentive to replace pipes rather than repair them even if it is not in the best interest of ratepayers. At minimum, this issue requires additional scrutiny from the PSC and stakeholders.

WGL's prioritization of pipes for replacement is ineffective and poses risks to public safety

WGL's application emphasizes that it will identify pipes for replacement based on probabilistic risk analysis rather than by identifying actual leaks. WGL plans to use modeling software to estimate the likelihood of a pipe to leak, with the estimate based on pipeline properties, operating conditions, installation details, and maintenance and inspection history.[21] There are a number of inherent shortcomings in WGL's use of statistical models to identify pipes for replacement, including the uncertainty inherent in risk modeling when used with data of poor quality.[22] Previous studies have shown that a small fraction of leaks accounts for a majority of methane volume released, and it is not clear whether or to what extent WGL has incorporated this fact into its prioritization.[23]

Indeed, the Company's application does not detail how it specifically makes decisions using these risk models. In Witness Stuber's testimony, he states that the models will "allow the Company to evaluate various preventive and mitigative measures and make informed decisions surrounding the optimization of risk mitigation activities".[24] How the Company actually uses the models to make informed decisions is not specified, requiring further discovery and investigation.

What is clear is that WGL's prioritization approach allows actual leaks to go unrepaired. As DOEE pointed out in the Pipes 2 proceeding, in January 2014, an independent team of scientists from Duke University, Stanford University, Boston University, and Gas Safety, Inc., published their research findings concerning the frequency and extent of natural gas leaks actually occurring in the District of Columbia based on a field survey of 1500 road miles.[25] Using advanced leak detection (ALD) over a two-month period in 2013,

[21] See Direct Testimony of Aaron C. Stuber, Exhibit WG (B), Pg. 12.

[22] See EXHIBIT WG(B)-1, a PHMSA report submitted by WGL with their application to support their use of risk modeling: "For many pipeline risk models, improving the scope and quality of input data is a long-term process. The operator should understand the overall characteristics of the risk model data set and implement actions to ensure needed data quality and seek continuous improvement in the data gathered and input to the model. Risk model data quality issues can increase uncertainty in the results from the model. If the results are used to support decision making, then the results should be interpreted in light of those uncertainties."

[23] Ackley, Bob & Philips, Nathan. 2021. "2021 Fugitive Methane Emission Survey of the District of Columbia". For the Washington, D.C., Department of Energy and Environment.

[24] See Direct Testimony of Aaron C. Stuber, Exhibit WG (B), Pg. 11.

[25] Jackson, et al. 2014. "Natural Gas Pipeline Leaks Across Washington, D.C.". *Environmental Science and Technology*, January 16, 2014. https://doi.org/10.1021/es404474x.

the team located 5,893 active gas leaks, including 12 locations with previously unreported Grade 1 leaks. By contrast, WGL reported only 1,542 gas leaks to PHMSA over the entire 2013 calendar year.[26]

WGL does not adequately prioritize best available ALD-technology to identify leaks

In 2021, DOEE contracted with technical consultants to drive 713 miles of District streets and survey for methane leaks.[27] That survey identified 3,346 locations with elevated methane concentrations. Detailed review of 40 of those locations confirmed that 39 of these locations were closely associated with gas infrastructure and therefore very likely represented location of leaks in the gas system. WGL reported only 1,443 leaks on its system to PHMSA for all of 2021. A copy of DOEE's leak survey is attached hereto as "Exhibit 2."

As this survey demonstrates, ground-based ALD technology is capable of detecting far more leaks than statistical models. Actual leaks present risks to public safety and the climate, and leaking pipes should be prioritized for repair and replacement, not pipes that have an uncertain, estimated level of risk. In PHMSA's report, *Pipeline Risk Modeling Overview of Methods and Tools for Improved Implementation*, cited by WGL in their application as justification for risk modeling, PHMSA notes that "risk analysis results should not be used to defer/delay the normal process of pipeline system remediation of known deficient conditions."[28] DOEE has been emphasizing the need to prioritize actual leaks over risk models for years, including in comments on the Pipes 2 application.[29] However, despite the ability of ALD to identify actual high-volume leaks, WGL's Pipes 3 Application proposes only limited incorporation of ALD technology, and this technology does not appear to be the basis of the majority of pipe replacement prioritization.

In WGL's execution of Pipes 2, its implementation of ALD was insufficient and misleading. The Commission decided, via Order No. 21580 in the PROJECT*pipes* 2 application case, that the Company's execution of its approved ALD program was deficient and did not use appropriate ground-based ALD technology. Rather, WGL used unapproved satellite technology without seeking an amendment to the ALD pilot program. The Commission then directed the Company to implement ground-based ALD and begin repairing the actual methane emissions point locations found by DCG's independent survey of gas leaks.

Despite this order, the Pipes 3 application does not follow the approach to ALD that the Commission directed in its decision via Order No. 21580. The Commission directed WGL to use vehicle-mounted methane detectors as its ALD technology in the program, rather than satellite-based technology that was not approved. Witness Hays states in his testimony that the company plans to:

---

[26] See https://www.phmsa.dot.gov/data-and-statistics/pipeline/gas-distribution-gas-gathering-gas-transmissionhazardous-liquids

[27] Ackley, Bob & Philips, Nathan. 2021. "2021 Fugitive Methane Emission Survey of the District of Columbia". For the Washington, D.C., Department of Energy and Environment.

[28] EXHIBIT WG(B)-1, pg. 27.

[29] See Formal Case No. 1154, Final Brief of the District of Columbia Government.

1. Use satellite-based ALD technology to capture indications of “High Emitters” over the District of Columbia.
2. Use a ground-based ALD technology to survey wide areas around those “High Emitter” indications.
3. Perform ground truthing with qualified technicians in those wide areas to assess, grade, and repair any confirmed leaks.

WGL provides no specifics on the type of ground-based ALD technology it plans to use, and still continues its plan to use unapproved satellite-based ALD technology with known quality issues to locate leaks.[30]

The largest expenditure in the proposal is not based on actual leaks nor quantified leak risks

The single highest proposed program expenditure in Pipes 3 is for work that WGL claims will be compelled by the District of Columbia Power Line Undergrounding plan (DC PLUG): $240.5 million. This is a program designed to address the risks to pipelines associated with the construction of DC PLUG. Through this program, the Company replaces pipes near underground construction initiated through DC PLUG.[31] These pipes are not replaced due to measured leak rates or prioritized by levels of calculated risks – they are replaced due to proximity to third-party construction projects. Because of this, the largest expenditure of the Pipes 3 program is not directly related to decreasing actual leaks or the highest areas of risk. It is not clear at this time whether WGL’s approach is necessary or cost-effective. While this work may be compelled by others’ construction, its expense highlights the importance of taking a holistic picture of pipeline repair, replacement, need, costs, and benefits across the District of Columbia—which WGL’s application does not present.

V. WGL’s Program Is Not Achieving the Intended Results

Despite hundreds of millions in expenditures, PROJECT*pipes* is not achieving the goals of preventing or mitigating future leaks, as shown by the data on the PSC’s Natural Gas Leaks webpage.[32] Table 2 shows that the total number of leaks has increased, rather than decreased, since 2017 (which was itself several years after this program launched). This table also shows that the increase in leaks comes from hazardous leaks (other leaks have decreased). This is extremely concerning from a safety perspective.

---

30 See Order No. 21580: “We did not explicitly or implicitly give the Company the discretion to unilaterally switch technologies so that ratepayers end up funding, through regulatory asset treatment, the research and development of a technology that has apparently not yet been successfully used in an urban environment, especially one with a dense tree canopy and numerous solar arrays, as is the case in the District.”

31 See Direct Testimony of Greg De Kramer, Exhibit WG (C), Pg. 3.

32 DCPSC.org. Natural Gas Leaks in the District of Columbia. Updated December 2022. Available at: https://dcpsc.org/Utility-Information/Natural-Gas/Natural-Gas-Leaks.aspx#:~:text=The%20DCPSC%20oversees%20WGL%20compliance,performance%20both%20quarterly%20and%20annually

Lastly, 2021 shows a significant jump in hazardous leaks as a percent of total leaks (71%) relative to 2020 (58%) and all other years.

As WGL Witness Hays points out, prompt actions to repair leaks obviate the near-term need to replace the pipe that has been repaired.[33] Replacement actions take time to prepare and plan, while repairs are undertaken more rapidly. If replacement is not reducing the incidence of leaks, a repair-based approach is likely to be a better use of ratepayer funds to meet the District's safety and emissions objectives.

Table 3. Leaks on Mains and Services (in total)

	2017	2018	2019	2020	2021	Difference (2021 vs. 2017)
Hazardous	757	1,050	1,140	878	1,019	262
Other	460	608	686	637	424	-36
Total	1,217	1,658	1,826	1,515	1,443	226
% Hazardous	62%	63%	62%	58%	71%	

In addition, leak reductions are not a key performance metric for the program; instead, program performance metrics focus on construction timeline and cost. Despite the Company's claimed focus on safety and climate hazards, the performance metrics do not include any focus on reduction of hazardous leaks and associated emission reductions.

Frank conversations with community members in areas with pipes likely to have hazardous leaks, with cost-effectiveness data in hand about the three mitigation strategies (replacement, repair, and electrification), can better inform the path forward. It could be that community members who are aware that they live in an area with a high propensity for hazardous gas leaks and the potential need for construction disturbances to replace pipes may be more willing to electrify. Neighborhood-centered outreach in areas prone to hazardous leaks may uncover a preference for repair and/or electrification over pipe replacement.

[33] See Direct Testimony of Ken Hays, Exhibit WG (D), Pg. 3-4.

DOEE COMMENTS

EXHIBIT 1

GOVERNMENT OF THE DISTRICT OF COLUMBIA
OFFICE OF THE ATTORNEY GENERAL

ATTORNEY GENERAL
BRIAN L. SCHWALB

Public Advocacy Division
Social Justice Section

ELECTRONIC FILING

February 28, 2023

Ms. Brinda Westbrook-Sedgwick
Public Service Commission
Of the District of Columbia Secretary
1325 G Street, NW, Suite # 800
Washington, DC 20005

Re: Formal Case No. 1167 – In the Matter of the Implementation of Electric and Natural Gas Climate Change Proposals,
and
Formal Case No. 1154 – In the Matter of Washington Gas Light Company's Application for Approval of a PROJECT*pipes* 2 Plan,
and
Formal Case No. 1130 – In the Matter of the Investigation into Modernizing the Energy Delivery System for Increased Sustainability.

Dear Ms. Westbrook-Sedgwick:

On behalf of the District of Columbia Government (the District), please find the enclosed Report from Gas Safety USA entitled "Strategic Electrification in Washington, D.C.: Neighborhood Case Studies of Transition from Gas to Electric-Based Building Heating." The Department of Energy and Environment commissioned this Report as a follow up to an earlier report (attached) from Gas Safety USA entitled "2021 Fugitive Methane Emissions Survey of the District of Columbia" filed on November 30, 2021, in Formal Case Nos. 1130 and 1154.

The District reserves the right to file this Report in additional PSC dockets as relevant and appropriate. If you have any questions regarding this filing, please do not hesitate to contact the undersigned.

Respectfully submitted,

BRIAN L. SCHWALB
Attorney General

By: /s/ *Brian Caldwell*_________
BRIAN CALDWELL
Assistant Attorney General
(202) 727-6211 – Direct

Email: brian.caldwell@dc.gov

cc: Service List

Strategic Electrification in Washington, D.C.: Neighborhood Case Studies of Transition From Gas to Electric-based Building Heating

For the Washington, D.C., Department of Energy and Environment

December 14, 2022

Bob Ackley
Gas Safety, USA
16 Brook Lane, Southborough, MA 01772
robert.c.ackley@gmail. com
508-344-9321

Nathan Phillips
Department of Earth and Environment
Boston University
685 Commonwealth Avenue
Boston, MA 02215
nathan@bu.edu
617-997-1057

Table of Contents

1. Executive Summary

The purpose of this study is to complete the second part of an overall study by the Department of Energy and Environment (DOEE) to understand how best to reduce methane emissions associated with the use of natural gas in the District and how such reductions may occur cost-effectively. Phase 1 of the study, completed in 2021, was a city-wide survey of where fugitive methane emissions might be occurring. Phase 2 builds on the Phase 1 data to create seven neighborhood case studies which compare strategic electrification to pipe replacement from a cost and climate mitigation perspective.

Methane leaks from natural gas infrastructure, beyond the inherent risk of explosions, contribute to climate change, damage trees, degrade air quality, and waste ratepayer funds. Determining where the largest leaks and most leak-prone pipes are in a city can help city planners and community stakeholders develop a strategic, neighborhood-scale transition plan to electric-based building heating. This allows leaks to be monitored and repaired, saving substantial costs of pipeline replacement. In this Phase 2 study, we analyzed gas leak data and gas pipeline characteristics in seven selected neighborhoods from a city-wide Phase 1 leak survey study conducted in 2021. We used these neighborhoods as case studies to illustrate greenhouse gas emissions impacts and cost avoidance of pipeline replacement for block-scale electrification across the District and other cities.

The seven neighborhoods were chosen as candidates for electrification based on the following criteria: residential areas, presence of leaking or leak-prone gas mains, non-critical mains (in which decommissioning pipelines would not impact large numbers of downstream gas customers), relatively large estimated methane leaks and corresponding climate and air pollution impacts, and proximity to public schools or other community buildings which could serve to “anchor” block-scale electrification.

Estimated climate benefits from block-scale electrification ranged from an estimated high exceeding 2000 metric tons of CO2 equivalent (CO2e) emissions avoided per year from three adjacent streets in Woodridge, to a low near 80 metric tons CO2e along a single street in Capitol Hill. Using nominal recent cost estimates, these translate to avoided annual retail costs of leaked gas of ~$60k and $2k, respectively, and avoided pipeline replacement costs on the blocks studied in these neighborhoods of $2.5M and $1.5M, respectively. We estimate every leak in each of these two end member neighborhoods could be repaired for $25k-$55k. The other five neighborhood case study areas fell within these bounds.

We describe a flexible approach to block-scale electrification involving various stages of gas pipeline management for retirement and pipeline decommissioning. This transition sequencing flexibility can ensure service reliability and instill confidence among stakeholders and customers on diverse streets and built environments.

Where appropriate, repairing leaks or rehabilitating rather than replacing pipelines should be considered as part of a cost-effective strategy to manage gas pipelines for retirement. Exemplifying this point, the two largest leaks in our 2021 study were repaired by the utility company, saving an average of 45 U.S. homes' worth of natural gas use. We estimate the one-time cost of these repairs to ratepayers to be between one tenth and one hundredth of the cost of pipeline replacement on that street.

The two leak repairs we observed demonstrates the key electrification strategy of "triage and transition", wherein an existing pipeline network is managed for retirement with enhanced leak monitoring and repair of the largest leaks, with cost savings of this approach shifted toward financing electrification, substantially and in some case studies fully covering single-family and multi-family electrification costs based on cost estimates from recent studies in DC. The results from this study are intended to aid the District of Columbia Public Service Commission in developing a strategic building electrification plan that can leverage savings from safe and cost-effective management of gas pipelines for retirement.

Gas Safety, Inc., and Nathan Phillips are wholly responsible for the content and data reported herein.

2. Introduction

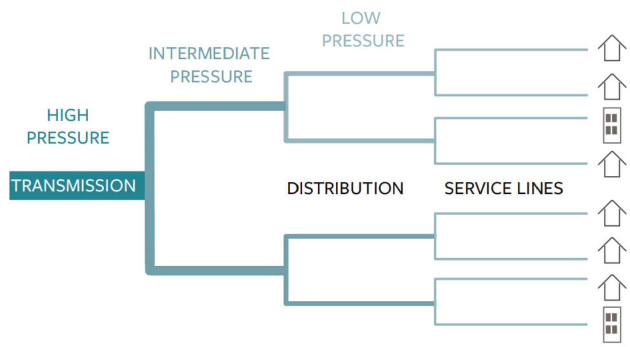
In this study we investigate climate and monetary impacts of pipeline methane leaks, and implications of pipeline replacement versus pipeline repair and retirement, as part of a strategy for transitioning building heating along those streets to electricity. This aligns with DOEE's proposed "non-pipes safety alternative" as proposed in response to Washington Gas Light Company's Climate Business Plan.[1] Our analysis identifies costs of pipeline replacement, which can be saved with less costly advanced leak repair and enhanced leak monitoring instead. Gas pipeline replacement, depending on the density of buildings on a street and the number of service lines, may cost ratepayers between $1M-$5M per mile, and represents a commitment to this infrastructure for decades, while compliance with the District's climate mandates, including the legislated mandate of reaching carbon neutrality by 2045, requires large, near-term emissions reductions.

Distribution gas pipeline leaks are widespread across east coast cities including Washington, DC (Jackson et al. 2014; Ackley and Phillips Phase 1 Study, 2021). These gas leaks can present explosion risks, pollute air (West et al. 2006), damage street trees (Schollaert et al. 2020), waste ratepayer money (Seavey 2021), and release a potent greenhouse gas, methane (Phillips et al. 2013). While pipeline replacement is effective in eliminating gas leaks, pipeline repair is often a more cost effective way to address the gas leaks problem without large public investment and infrastructure lock-in (e.g., Seavey, 2021).

The architecture of gas distribution systems like that in Washington, DC, generally resembles a tree (Figure 1), with larger diameter, high pressure transmission ("trunk") lines branching into lower pressure and diameter pipes down to the low pressure gas mains running along streets and sidewalks, to the smallest diameter (often 1"-2" for small residential) service lines, akin to twigs and petioles, into houses. This structure suggests that an orderly and manageable transition of the gas network may be possible by "pruning the tree" from the distal ends in, which can retract the gas network in a way that allows the remaining network to stay viable as it shrinks in size while being replaced with electric-based heating.

Figure 1. Schematic depiction of a generalized gas distribution network. Figure adapted from Ackley et al. (2019). Reprinted with permission.

[1] https://edocket.dcpsc.org/apis/api/Filing/download?attachId=105393&guidFileName=9bdbe1aa-b3f8-4282-8dbe-e5f994464caa.pdf



Analysis of the physical status of gas lines on streets for the purpose of strategic electrification involves data on both leaks and leak-prone pipe. Even if a street has no leaks at a given time, if it is underlain by leak-prone pipe, typically cast iron or unprotected steel (including some types of wrapped steel), it may be a suitable candidate for electrification since leaks are expected to develop at any time. With streets that have both leak-prone pipe and detected leaks, additional considerations apply: the savings in money, greenhouse gas emissions, safety risk reduction, air quality, and tree health that result from targeted repair of the largest leaks. Targeting leaks for repair as a strategy is supported by data that a relatively few leaks in a population account for a disproportionately large amount of total leaked gas. Hendrick et al. (2016) found that, in leak prone pipeline distribution systems, seven percent of the leaks accounted for 50% of the total leaked gas among a population of leaks. Thus, municipalities and utilities can cost-effectively target a relatively small number of leaks for repair for maximum beneficial impact, without wholesale pipe replacement (Magavi 2018; Magavi et al. 2019). This allows for a strategy of "Triage and Transition" (Ackley et al. 2019).

This Phase 2 study builds on our 2021 Phase I study (FC1154 - 218, FC1130 - 658) which detected 3,346 gas leaks in residential areas across the District. Here, based on inspection of leak-prone pipe with significant suspected leakage from Phase I results, we re-visited selected streets across diverse neighborhoods to more closely examine evidence of leak-prone pipe, presence and size of gas leaks, and building types and layouts that may be suitable for electric heating. Importantly, this study considered only the physical condition of infrastructure and buildings, recognizing that this is a prerequisite of a comprehensive process to develop a strategic building electrification plan in the District of Columbia. This report is intended to provide background information that could be helpful in supporting such planning.

3. Context and Scope of Work

Clean Energy DC, the DC Climate Action Plan commits to reducing greenhouse gas emissions 50% below 2006 levels by 2032, while the forthcoming Carbon Free DC Plan will outline the long-term framework for carbon neutrality. Within that context, this study supports the DC Public Service Commission Formal Case Nos. 1154, 1167, and 1175. Formal Case No. 1154 considers Washington Gas Light Company's PROJECTPipes pipeline replacement plan (currently in the final year of its second planning phase). Formal Case No. 1167 is a proceeding to consider how well the regulated gas and electric utilities are meeting DC's climate action targets and timelines, and what additional guidance may be necessary to achieve these targets going forward. Finally, Formal Case No. 1175 will consider Washington Gas Light Company's recently filed PROJECTpipes 3 application seeking approval from the DC Public Service Commission for a third planning phase for its pipeline replacement plan to be implemented starting Jan. 1, 2024. For further background on the regulatory proceedings and the gas leaks problem in DC, please see our Phase 1 report, attached hereto as "Attachment A."

For this Phase 2 study, DOEE sought a professional consultant to assist DOEE and the Office of the Attorney General by providing analysis regarding Washington Gas Light Company's proposals to replace leak-prone pipes in the District of Columbia. The scope of work requested consisted of (1) analyzing Washington Gas Light Company's proposed pipe replacement locations and the associated costs, (2) field-quantifying the amount of fugitive emissions from leaks with very high levels of methane concentrations from at least four highly leak-dense neighborhoods as identified by DOEE, (3) providing an alternative feasibility analysis and identifying potential opportunities to avoid pipe replacement via policy-driven building electrification. The analysis should result in a written report, including a detailed analysis of the field quantification and an assessment of potential areas where pipe replacement can be avoided based on available data and field study to further GHG reduction and hazard mitigation. The work may include responding to data requests and submitting testimony as needed.

From our Phase 1 study, DOEE staff identified seven neighborhoods based on the above-described criteria, and we based our analysis on the data obtained in the Phase 1 study. We note that leak conditions may have changed in the intervening time, including leak repairs. Thus, these case studies are intended to demonstrate the potential GHG, financial, and pollution savings and other benefits, but not necessarily to state a precise current estimate for a continuously dynamically developing state of the gas pipeline network, both from 2021 to present, and into the immediate and longer term future.

4. Materials and Methods

For the seven neighborhoods of interest, we performed the following procedures:

1. Review leak locations and peak methane concentrations from the 2021 Phase 1 report.
2. Re-survey 2021 leak locations in selected blocks within the seven neighborhoods, to determine whether gas leaks from 2021 were still actively leaking in 2022, and whether any leak repairs were made.

3. Estimate volume flux of leaking gas (in Standard Cubic Feet per Day and in metric tons of Carbon Dioxide equivalent[2]) from each of the leaks surveyed in streets within the seven neighborhoods. To produce these flux estimates we used the method described in Weller et al. (2019), using our 2021 survey leak concentration data. This method is described in detail in Appendix 2.
4. Estimate the value of leaked gas based on recent residential prices of natural gas[3].
5. Inspect streets for utility markings indicating location, diameter, and/or material of existing gas mains, with a particular focus on leak-prone pipe which could be a candidate for either replacement or managed retirement (Figure 2).

Figure 2. An example street marking we used to record suspected pipeline material and size (in this case 6” diameter, wrapped steel [STL]).

6. Compute the suspected number of services and total square footage of buildings served by existing gas mains, which will need to be served by electric-based heating upon transition.

[2] To convert methane emissions estimates to carbon dioxide equivalents, we use the methane global warming potential estimate of 29.8 based on the Intergovernmental Panel on Climate Change (Forster et al. 2021). To express carbon dioxide equivalents in terms of a number of average US households’ carbon emissions, we use 48 metric tons per year per household, based on estimates from the University of Michigan Center for Sustainable Systems. https://css.umich.edu/publications/factsheets/sustainability-indicators/carbon-footprint-factsheet

[3] The price used in this report is from the US Energy Information Administration 2021 annual price in DC of $14.43/1000 cubic feet. (https://www.eia.gov/dnav/ng/hist/n3010dc3A.htm)

7. Compute length of streets for which an equivalent length of pipeline replacement would be necessary, and pro-rate the cost to ratepayers for pipeline replacement. Here we use a length-pro-rated $3.2M/mile for pipeline replacement costs based on a December, 2019 Washington Gas Light Company Project Pipes Annual Report[4], recognizing that values may vary by street building density and required service line density and other characteristics and through time.
8. Compare the cost of pipeline replacement to estimated cost of leak repair, using a $5k/leak based on leak repair costs reported in similar gas distribution systems by Seavey (2021, p. 28).

5. Case Studies: Results and Discussion

The seven neighborhoods of interest to DOEE for analysis are shown in the DC Phase 2 area map below (Figure 3). Background information on the case studies is included in Appendix 1. Table 1 presents summary results for these seven case studies.

[4] From this WGL report: "Through PROJECT Pipes, Washington Gas is nearing completion of the first five and a half years of this 40-year initiative, with authority to spend up to $122.5 million, to replace 8,000 bare and/or unprotected steel service segments, 10 miles of bare steel main, eight miles of targeted unprotected steel main, and 20 miles of low pressure and medium pressure cast iron main in the District of Columbia." Thus, 38 miles of main at $122.5M (Assume most of the service line replacements are attached to these mains) = $3.22M per mile.

Figure 3: Area map showing seven neighborhoods analyzed in this study.

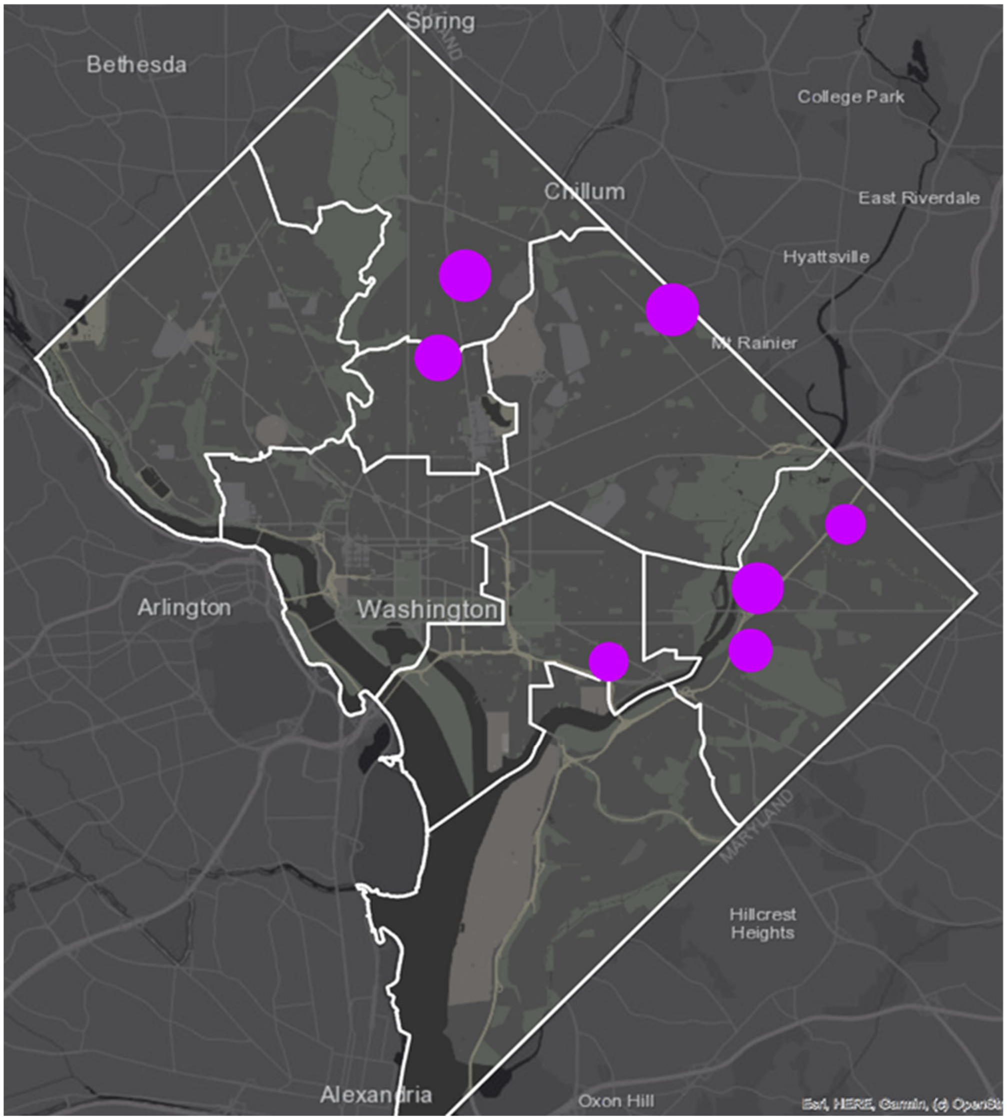


Table 1. Summary of Neighborhood Streets Case Study Results. Leak rates are in cubic feet per day (CFD); emissions rates are in metric tons (tonnes) per year. Leak repair cost of $5k/leak is estimated from Seavey (2021, p. 48).

Neighborhood streets	**Suspected pipe material**	**No. of leaks/ miles**	**Leak rate (CFD)**	**Emissions (CO2e; tonnes/yr)**	**Est. repair cost**	**Est. pipeline replacement cost**
Brightwood Park	cast iron	9/0.5	665	146	$45K	$1.5M
Capitol Hill	cast iron	6/0.5	356	78	$30K	$1.6M
Columbia Heights	cast iron	7/0.5	556	122	$35K	$1.5M
Deanwood	wrapped steel/ unknown	5/0.4	1150	253	$25K	$1.25M
Greenway	Steel	3/0.3	650	143	$15K	$0.85M
River Terrace	wrapped steel	5/ 0.6	740	162	$25K	$1.9M
Woodridge	Cast iron + wrapped steel	11/0.8	12,100	2660	$55K	$2.6M

The summary results from Table 1 have two significant policy implications: first, the cost of pipeline replacement is on average 25 times the cost of pipeline repair. Second, as exemplified by the Woodridge leak repairs, finding and repairing the largest leaks can be a cost- and climate-effective approach to triage leak-prone pipe, save ratepayer money, and allow ratepayer funds to be allocated toward electrification. In Woodridge, repairing only two of the 11 leaks reduced estimated emissions and associated costs by 75%.

5.1. Reallocation of savings from repair-instead-of-replace.

Although a comprehensive cost-benefit analysis is beyond the scope of this study, we estimate key monetary benefits and potential for reallocation of savings from a strategy prioritizing pipeline repair (with enhanced leak monitoring) instead of replacement. Here we use recent building electrification cost estimate studies specifically focused in the District of Columbia, specifically Pantano et al. (2022) and the Building Electrification Institute (2020).

From these studies, we bracket estimated one-time rewiring and appliance electrification costs for "moderate" and "high performance" household electrification categories as described by the Building Electrification Institute (2020). That study defines and estimates "moderate" and "high performance" electrification costs in DC at approximately $18K and $33K per household for representative single-family homes, respectively; and $16K and $23K for representative multi-family homes, respectively. Here we use these estimates as nominal, understanding that the specific housing stock in our case studies vary from the assumed "Baseline Buildings" in the Building Electrification Institute (BEI) study and that electrification costs may change in the future, including with financial incentives at the municipal and federal levels, such as the Inflation Reduction Act of 2022.

Cost savings of building electrification also include avoided social costs of carbon. The social cost of carbon (SCC) concept is a monetary valuation of climate damage associated with combustion of fossil fuels and other carbon-based fuels. Recent studies present a range of social cost of carbon estimates (e.g., Prest et al., 2022). We use DOEE's recommended values to bracket the SCC from $117/metric ton to $475/metric ton.[5] Importantly, this social cost of carbon does not include valuation for co-costs of combustion, including healthcare and safety costs due to air pollution and safety risk impacts on residents. These estimates are beyond the scope of this study but should be considered in a full benefits-cost analysis of building electrification. Table 2 presents savings from a strategy that manages pipelines for repair and retirement. These funds could be re-allocated toward building electrification of dozens to over 100 District households.

[5]https://edocket.dcpsc.org/apis/api/Filing/download?attachId=143219&guidFileName=9a60d7a2-b795-47e2-b65f-639ce2fa4c96.pdf, pg 227

Table 2. Estimated monetary savings of leak repair and pipeline decommissioning cost.

Neighborhood	Net savings from pipe repair vs replacement	One-time Pipeline decommissioning cost*	No. households pot. electrified with net savings (low/high)**
Brightwood Park	$1.4M	$106K	38/76
Capitol Hill	$1.5M	$94K	42/82
Columbia Heights	$1.4M	$95K	39/77
Deanwood	$1.2M	$30K	36/70
Greenway	$0.8M	$12K	24/47
River Terrace	$1.8M	$111K	51/100
Woodridge***	$2.5M	$59K	73/141

*Based on City of Palo Alto (2020), cited in Pantano (2022)
**Based on BEI (2020) "moderate" and "high performance" upgrades, estimated at $17k and $33k, respectively.
***Prior to leak repair of the two largest leaks.

Although this study compares neighborhood-based costs and benefits, it is important to recognize that utility infrastructure financing is typically spread across distribution service areas, so that ratepayers across the District finance upgrades on individual streets. That is, the costs of new infrastructure are "socialized" across ratepayers. Therefore, both the savings shown in Table 2 and investments in electrification are to a substantial degree "shared" with ratepayers across DC. In that regard, | e note that the cost savings magnitude of avoiding a business-as-usual pipeline replacement program is large: Pantano et al. (2020) report in Docket FC1167: "the same $4.5 billion price tag for gas distribution upgrades could provide $27,400 worth of electrification upgrades to each of the approximately 164,000 housing units currently using gas in the District." This would more than cover all of the BEI-estimated household electrification costs of "moderate" category electrification ($16k-$18k), and nearly cover the highest performing single family home electrification cost, estimated here at $33k.

In addition to savings from pipeline repair instead of replacement, recurring cost savings accrue each year that pipelines no longer leak. Moreover, according to the BEI (2020) household heating bills in upgraded households can be reduced by approximately $400-$800 annually. These recurring/ongoing savings are summarized in Table 3.

Table 3. Cost savings from leak repair and upgraded household heating systems.

Neighborhood	Annual savings from leak repair	Savings from social costs of carbon (low/high)	Annual total of electrified households' energy cost savings* (low/high)
Brightwood Park	$4.2K	$14.5K/$58.5K	$15K/$61K
Capitol Hill	$2.3K	$7.8K/$31.4K	$17K/$66K
Columbia Heights	$3.5K	$12.1K/$49.1K	$16K/$62K
Deanwood	$7.3K	$24.7K/$101K	$14K/$56K
Greenway	$4.1K	$14.0K/$57.1K	$10K/$38K
River Terrace	$4.6K	$16.0K/$65.0K	$20K/$80K
Woodridge	$76K**	$260K/$1.1M***	$29K/$113K

*Based on estimates of $400 (multi-family) to $800 (single family) annual household energy savings from upgraded electrified households from BEI (2020, slides 27, 40), multiplied by the number of homes electrified from Table 2.
**Based on BEI (2020) "moderate" and "high performance" upgrades, estimated at $17k and $33k, respectively.
***Prior to leak repair of the two largest leaks.

5.2. Equity Consideration:
Strategic electrification described here should incorporate considerations of cost and environmental equity. This is because a natural gas grid managed for progressive retraction, block by block, can preserve equity, whereas electrification which occurs by customer defection, including disproportionately by affluent customers, would burden lower-income residents with the fixed cost of maintaining a gas grid at the same scale divided by fewer customers (Wright et al. 2022). Managed retraction reduces the fixed costs of operating the remaining gas grid, and in cases in which community heat pumps are appropriate, utilities may have an opportunity to shift business models, utilizing a similarly skilled gas worker and pipe-fitter workforce, to one in which installed and maintained pipelines deliver thermal energy rather than natural gas.

5.3. House-by-House and/or Street-Scale Electrification:
There are two distinct ways to achieve block-scale electrification in furtherance of the District's carbon neutrality mandate, with a full spectrum of intermediate steps between them. On one end, electrification could occur in a concerted manner at the scale of the street as a pipeline is actively decommissioned. At the other end, individual houses may electrify partially or wholly on individual schedules while the gas main is maintained and managed for eventual retirement. There are continuous gradations between these two scenarios in terms of the pipeline decommissioning time frame. What differentiates this spectrum of transition models from

building electrification strategies which consider buildings individually is the explicit linkage in this study to either decommissioning leak prone gas pipelines or managing them intentionally for retirement. Pantano et al. (2022)'s recommendations are consistent with the block-scale approach discussed here in calling for "Proactive Full Electrification" at the block scale, particularly on small residential streets.

Block-scale electrification need not be an "either-or" proposition with respect to gas, especially on streets with critical mains serving large numbers of downstream customers. Electrification on such streets (for example, Minnesota Avenue SE in the Greenway Neighborhood) may need to occur simultaneously with a program of pipeline management and repair for retirement. On arterial streets like Minnesota Avenue SE, often with multiple gas mains, a key to making continual progress toward complete electrification will be policy and a program of enhanced leak monitoring and repair, avoiding expensive pipeline replacement and the consequential multi-decade commitment to this infrastructure. On such arterial and/or high building density streets, building-by-building electrification could be made district-ready (where "district" with a small "d" refers generically to a neighborhood scale rather than the District of Columbia), with building heat pumps capable of eventually tapping into a shared district heat system, and/or district solutions could allow buildings to connect to the district when economically feasible. A flexible approach toward block-scale electrification can allow any street to move forward on electrification while instilling confidence in all stakeholders.

The results of the Commission's Community Heat Pump Pilot will provide information to the Commission and other District stakeholders about the efficacy and cost implications of such an approach.[6]

5.4. Next Steps Role of Community Stakeholders:

Equity considerations and the need for broad resident buy-in make a robust, community-led process essential for block-scale electrification. Community organizers and advocates can be assisted by city planners and others in engaging community activities which help educate residents to the benefits of building electrification. For example, research that educates residents about unhealthy compounds in natural gas (e.g., Michanowicz et al. 2022) can be paired with a program of voluntary in-home measurements of gas leaks from stoves and other appliances, which may educate residents about risks of exposure to indoor gas leaks. Also, demonstrations of cooking with induction have proven to be an engaging and educational community activity which promotes benefits of electrification. An example of community-led engagement in Boston was an Energy Shift Boston program involving free household electrical capacity checks, induction cooktop demonstrations, and education about safety and climate resilience benefits of electrification.

---

[6]https://dcpsc.org/getattachment/About-PSC/Procurement/Contracting-and-Procurement/Current-Solicitations/Final-RFP-No-PSC-22-06-5-16-(002).pdf.aspx?lang=en-US

5.5. Role of the District of Columbia Public Service Commission:

Results from this study can assist the Public Service Commission of the District of Columbia as it develops plans and guidelines to ensure that the electric and gas utilities are doing their part to achieve the District's ambitious climate targets and timelines, culminating in city-wide net zero carbon emissions by 2045. This study complements and helps build a more comprehensive valuation of the costs and benefits of building electrification by coupling it to a cost-effective program of progressive gas system retirement and decommissioning. A challenge and opportunity for the Commission will be to develop policies which allow the large potential savings from a program of pipeline management for retirement instead of replacement to be realized for the benefit of ratepayers, the safety, health and welfare of all of the residents of the District of Columbia, and the climate.

6. Literature Cited:

Ackley F, Fairchild M, Griffith S, Phillips N, LaRocque R. Rolling the Dice, Assessment of Gas System Safety in Massachusetts, V. 2, gasleaksallies.org, September 13, 2019. PDF file at: https://static1.squarespace.com/static/612638ab5e31f66d7ae8f810/t/615888c41ab1fe20dbe57188/1633192135840/Rolling+the+Dice.pdf

City of Palo Alto Utilities Advisory Commission, Discussion of Electrification Cost and Staffing Impacts on the City of Palo Alto's Electric and Gas Distribution Systems (Nov. 4, 2020) (ID # 11639). https://www.cityofpaloalto.org/files/assets/public/agendas-minutes-reports/agendas-minutes/utilities-advisorycommission/archived-agenda-and-minutes/agendas-and-minutes-2020/11-04-2020-special/id-11639-item-no-3.pdf.

Forster, P., T. Storelvmo, K. Armour, W. Collins, J.-L. Dufresne, D. Frame, D.J. Lunt, T. Mauritsen, M.D. Palmer, M. Watanabe, M. Wild, and H. Zhang (2021). Table 7.1, (p 1017) In: The Earth's Energy Budget, Climate Feedbacks, and Climate Sensitivity. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 923–1054, doi:10.1017/9781009157896.009.

Hendrick MF, Ackley R, Sanaie-Movahed B, Tang X, Phillips NG (2016) Fugitive methane emissions from leak-prone natural gas distribution infrastructure in urban environments. Environmental Pollution 213, 710-716

Jackson RB, Down A, Phillips NG, Ackley RC, Cook CW, Plata DL, Zhao K (2014) Natural gas pipeline leaks across Washington, DC Environmental science & technology 48 (3), 2051-2058

Magavi Z (2018) Identifying and Rank-Ordering Large Volume Leaks in the Underground Natural Gas Distribution System of Massachusetts. Masters Thesis, Harvard University. https://dash.harvard.edu/handle/1/37945149

Magavi Z, Schulman A, Ackley B, Salgado E, Hendrick M, Phillips NG (2019) Identification of Large Volume Leaks in Natural Gas Distribution Systems AGU Fall Meeting Abstracts 2019, GC51M-0970

Michanowicz DR, Dayalu A, Nordgaard CL, Buonocore JJ, Fairchild MW, Ackley R, Schiff JE, Liu A, Phillips NG, Schulman A, Magavi Z, Spengler JD (2022) Home is Where the Pipeline Ends: Characterization of Volatile Organic Compounds Present in Natural Gas at the Point of the Residential End User. Environmental Science & Technology 2022 56 (14), 10258-10268 DOI: 10.1021/acs.est.1c08298

Pantano S, Calisch S, Edelman DM (2022) Electrification Study for the District of Columbia. Rewiring America. 59 pp.

Phillips NG, Ackley R, Crosson ER, Down A, Hutyra LR, Brondfield M, Karr JD, Zhao K, Jackson RB (2013) Mapping urban pipeline leaks: Methane leaks across Boston. Environmental pollution 173, 1-4

Prest B, Wingenrogth J, Rennert K (2022) The Social Cost of Carbon: Reaching a New Estimate. Resources Magazine. Resources for the Future.

Schollaert C, Ackley RC, DeSantis A, Polka E, Scammell MK (2020) Natural gas leaks and tree death: A first-look case-control study of urban trees in Chelsea, MA USA. Environmental Pollution 263, Part A, 114464.

Seavey, Dorie (2021). GSEP at the Six Year Mark: A Review of the Massachusetts Gas System Enhancement Program. PDF at: https://static1.squarespace.com/static/612638ab5e31f66d7ae8f810/t/61561b8c4955b93159a753a3/1633033102069/GSEPatTheSix-YearMark.pdf

Von Fischer JC, Cooley D, Chamberlain S, Gaylord A, Griebenow CJ, Hamburg SP, Salo J, Schumacher R, Theobald D, Ham J (2017) Rapid, Vehicle-Based Identification of Location and Magnitude of Urban Natural Gas Pipeline Leaks. Environmental Science & Technology. 51:4091-4099. DOI: 10.1021/acs.est.6b06095

Weller ZD, Yang DK, von Fischer JC (2019) An open source algorithm to detect natural gas leaks from mobile methane survey data. PLoS ONE 14(2): e0212287. https://doi.org/10.1371/journal.pone.0212287

West JJ, Fiore AM, Horowitz LW, Mauzerall DL (2006) Global health benefits of mitigating ozone pollution with methane emission controls. PNAS. 103, 3988-3993.

Wright J, Ackley R, Gopal S, Phillips N (2022) The BosWash Infrastructure Biome and Energy System Succession. Infrastructures 7, no. 7: 95. https://doi.org/10.3390/infrastructures7070095

7. Appendices

Appendix 7.1. Neighborhood Case Study Background

The seven neighborhoods studied here are: Brightwood Park/Petworth, Capitol Hill, Columbia Heights, Deanwood, Greenway, River Terrace, and Woodridge. Along selected streets and street blocks investigated, we recorded lengths of streets and lengths of associated gas mains, the number, square footage, and type of buildings (e.g., residential, multi-family, schools), the number of households, suspected pipeline mains material and size (ascertained from street markings), leak locations, and leak size estimates. These data are itemized in a project data sheet available here.

The following pages zoom into each neighborhood to summarize the state of leaks, pipeline infrastructure, and buildings which are itemized in the data sheet. In each of the seven zoomed-in maps that follow, red dots indicate leak locations detected in our Phase 1 analysis.

7.1.1 Case Study 1: Brightwood Park/Petworth

1A. Neighborhood Description: According to Wikipedia, Brightwood Park "is a small neighborhood in Northwest DC. The neighborhood is bounded by Georgia Avenue NW to the west, Missouri Avenue NW to the northeast and Kennedy Street NW to the south. More recently, areas that are technically part of the northern extremity of the Petworth neighborhood have been increasingly referred to as Brightwood Park. Often these informal boundaries extend south to Emerson Street NW, and east to New Hampshire Avenue NW. It is located in Ward 4.

Brightwood Park is largely characterized by row houses, detached and semi-detached houses, and small neighborhood businesses. The neighborhood is often misidentified as being part of adjacent neighborhoods, such as the Brightwood neighborhood, the Petworth neighborhood to the south and the Manor Park neighborhood to the north." Seventy-two percent of buildings in this neighborhood are serviced with gas heating (Pantano et al., 2022).

1B. Leaks: Within the Brightwood Park neighborhood, leaks were prevalent along Delafield Place NW and Emerson Street NW (Figure 4). Thus, we focused our study on two street segments:

- Delafield Place NW between Georgia Avenue NW and 8th Street NW, with four leaks within that two-block street interval and four leaks in the immediate vicinity of the bordering cross street intersections, totaling 900 feet; and

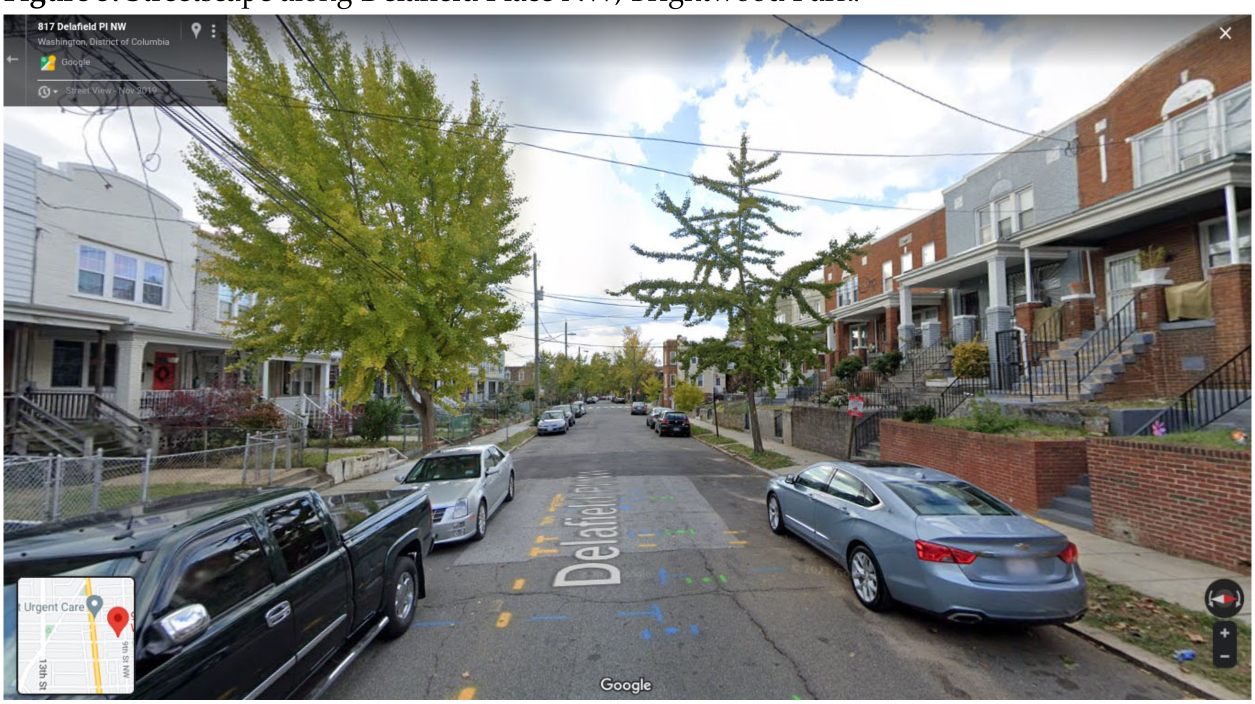
- Emerson Street NW between Georgia Avenue NW and Kansas Avenue NW, with five leaks along a four-block street interval, totaling 1600 feet.

Figure 4. Brightwood Park focus area. Emerson St. NW (horizontal street along top) and Delafield Pl. NW (horizontal street in mid-pane) were investigated in this study. Red dots indicate gas leaks detected in the Phase 1 study.

1C. Suspected Pipeline Material and Size:
Street markings ("mark-outs") indicated suspected 6" cast iron pipe on both street segments investigated. Cast iron pipe is considered leak-prone. Suspected operating pressure was "low". A full set of documentary photographs were used as the basis of suspected pipeline material and size.

1D. Building Stock: Types of Buildings, Number of Units, Square Footage: Delafield Place NW and Emerson Street NW contained 158 buildings, 156 of which were single family homes. The total square footage of both street segments was 243,859 square feet. Figure 5 shows a typical streetscape and residential buildings.

Figure 5. Streetscape along Delafield Place NW, Brightwood Park.



1E. Estimation of Leak Rates and Associated Carbon Equivalent Emissions, Costs of Leaked Gas: A total of nine leaks amounted to an estimated 665 CFD of leaked natural gas, equivalent to the gas consumption of 3.3 average US households, and a lost value of $9.60 per day, or about $3,500 per year, at current residential gas prices. Using a Global Warming Potential of 29.8 for methane compared to carbon dioxide (Forster et al. 2021), the 665 CFD of leaked gas is equivalent to 146 metric tons of carbon dioxide (CO2e) per year. For context, this equals about 3.0 average US household total carbon emissions.

1F. Estimated Pipeline Replacement and Repair Cost: The two street segments totaled 2500 feet in length (900 + 1600), which, using a $3.2M/mile replacement cost estimate, produces a pipeline replacement estimate of $1.5M for pipeline replacement. Using a $5k leak repair estimate (Seavey 2021), leak repair of all leaks would cost $45k.

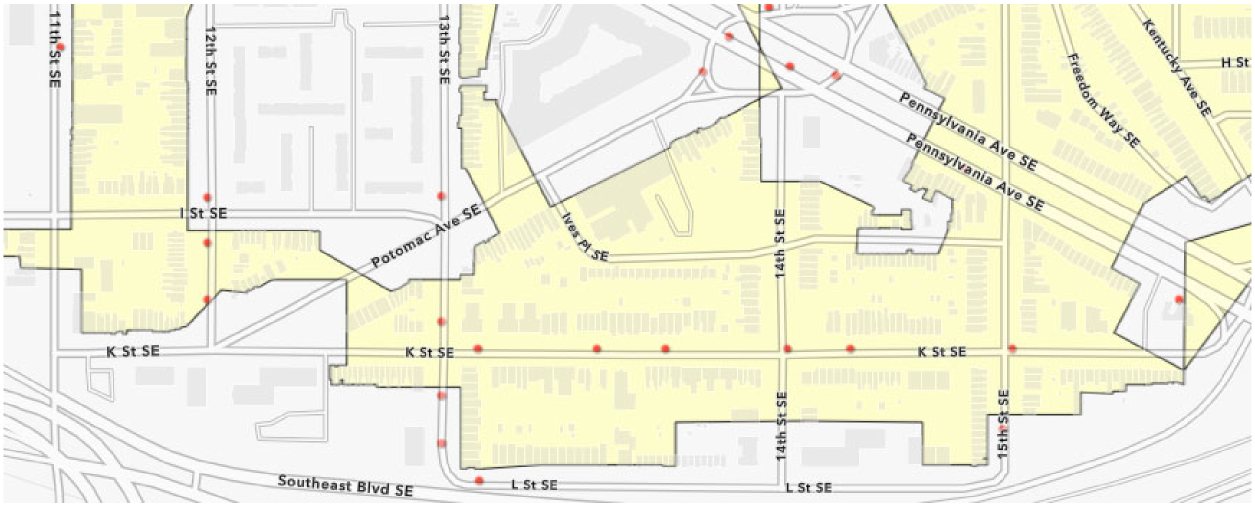
1G. Other Considerations Unique to this Neighborhood:
Three unique features of these two streets that relate to block-scale electrification potential include 1) shops and a restaurant on Georgia Ave NW, which could add beneficial diversity of heating and cooling loads for a shared geothermal system; 2) two alley sections between the two streets which could provide right of way for block-scale infrastructure; and 3) a potential community building, the Kings and Queens Childcare Center, located between Emerson Street NW and Delafield Place NW, at 4530 9th Street NW.

7.1.2. Case Study 2: Capitol Hill

2A. Neighborhood Description: According to Wikipedia, "Capitol Hill is the largest historic residential neighborhood in Washington, D.C., stretching easterly in front of the United States Capitol along wide avenues. It is one of the oldest residential neighborhoods in Washington, D.C., and, with roughly 35,000 people in just under 2 square miles, it is also one of the most densely populated." Forty-seven percent of buildings in this neighborhood are serviced with gas heating (Pantano et al., 2022).

2B. Leaks: Within the Capitol Hill neighborhood, leaks were prevalent along K Street SE (Figure 6). Thus, we focused our study on K Street SE between 11th Street SE and Pennsylvania Avenue SE, with six leaks within that five-block street interval, totaling 2,700 feet.

Figure 6. Capitol Hill focus area. K Street SE, was investigated in this study. Red dots indicate gas leaks detected in Phase 1 report; beige shaded areas indicated areas serviced with gas.



2C. Suspected Pipeline Material and Size:

Mark outs indicated suspected 6" Cast Iron type pipe on K Street. Cast iron pipe is considered leak-prone. Suspected operating pressure was "low." A full set of documentary photographs were used as the basis of suspected pipeline material and size.

2D. Building Stock: Types of Buildings, Number of Units, Square Footage: K Street contained 141 buildings, of which 102 were single family homes and 39 multi-family. The total square footage of the buildings on this street segment was 364,492 square feet. Figure 7 shows a typical streetscape and residential buildings, including a mix of newer multi-unit and older historic residential buildings.

Figure 7. Streetscape along K Street SE, Capitol Hill.

2E. Estimation of Leak Rates and Associated Carbon Equivalent Emissions, Costs of Leaked Gas: A total of six leaks amounted to an estimated 356 Cubic Feet per Day (CFD) of leaked natural gas, equivalent to the gas consumption of 1.8 average US households, and a lost value of $5.14 per day, or about $1,900 per year, at current residential gas prices. Using a Global Warming Potential of 29.8 for methane compared to carbon dioxide (Forster et al. 2021), the 356 CFD of leaked gas is equivalent to 78 metric tons of carbon dioxide (CO2e) per year. For context, this equals about 1.6 average US household total carbon emissions.

2F. Estimated Pipeline Replacement and Repair Cost: The street segment of 2700 feet in length, using a $3.2M/mile replacement cost estimate, produces a pipeline replacement estimate of $1.6M for pipeline replacement. Using a liberal repair estimate of $5k per leak (Seavey 2021), leak repair of all leaks would cost $30k.

2G. Other Considerations Unique to this Neighborhood: An alleyway between K Street SE and L Street SE could provide right-of-way for block-scale heating infrastructure. The Gifted Academy Educational Center is on this portion of K Street SE, and the Hopkins Apartment Public Housing complex is on the adjacent L Street SE, which could conceivably be served by a shared thermal loop with K Street SE.

We were unable to find square footage in 7 buildings containing 84 housing units on K Street SE, which were listed as federal properties. We assigned a nominal value of 1000 square feet to these units for the purpose of this analysis.

7.1.3. Case Study 3: Columbia Heights

3A. Neighborhood Description: According to Wikipedia, "Columbia Heights is a neighborhood in Northwest Washington, D.C. It has diverse demographics, the DC USA shopping mall and many restaurants, BloomBars, Meridian Hill/Malcolm X Park, Howard University, Banneker Recreation Center, and All Souls Church. Developed as a Washington suburb after the Civil War, growth accelerated in the early 1900s. The extension of the DC streetcar system in 1914 made the neighborhood a popular place to live among federal workers in the 1940s." Forty four percent of buildings in Columbia Heights have gas service (Pantano et al., 2022).

3B. Leaks: Within the Columbia Heights neighborhood, leaks were prevalent along two streets: Otis Place NW between 10th Street NW and 14th Street NW; and 10th Street NW, between Monroe Street NW and Spring Road NW (Figure 8). Four leaks were detected on Otis Place NW and three leaks on 10th Street NW. The combined length of the two street segments was 2500'.

Figure 8. Columbia Heights focus area. Otis Place NW and 10th Street NW were studied. Red dots indicate gas leaks detected in Phase 1 report; beige areas indicated areas serviced with gas.

3C. Suspected Pipeline Material and Size:
Mark outs indicated suspected 4” cast iron pipe on both Otis Place NW and 10th Street NW. Cast iron pipe is considered leak-prone. Suspected operating pressure was “low” on both streets. A full set of documentary photographs were used as the basis of suspected pipeline material and size.

3D. Building Stock: Types of Buildings, Number of Units, Square Footage: Otis Place NW and 10th Street NW segments investigated here contained a combined 142 buildings, of which 97 were single family homes and 44 multi-family. The total square footage of the buildings on these street segments was 287,052 square feet. Figure 9 shows a typical streetscape and residential buildings.

Figure 9. Streetscape along Otis Place NW, Columbia Heights, containing a mix of single family and multi-family housing.

3E. Estimation of Leak Rates and Associated Carbon Equivalent Emissions, Costs of Leaked Gas: A total of seven leaks amounted to an estimated 556 CFD of leaked natural gas, equivalent to the gas consumption of 2.8 average US households, and a lost value of $8.00 per day, or about $2900 per year, at current residential gas prices. Using a Global Warming Potential of 29.8 for methane compared to carbon dioxide (Forster et al. 2021), the 556 CFD of leaked gas is equivalent to 122 metric tons per day of carbon dioxide (CO2e) per year. For context, this equals about 2.6 average US household total carbon emissions.

3F. Estimated Pipeline Replacement and Repair Cost: The street segment lengths of 1500 feet along Otis Place NW and 1000 feet along 10th Street NW, using a $3.2M/mile replacement cost estimate, produces a pipeline replacement estimate of $1.5M for pipeline replacement. Using a liberal repair estimate of $10k per leak, leak repair of all leaks would cost $70k.

3G. Other Considerations Unique to this Neighborhood: Greater Tried Baptist Church is located within this portion of Otis Place NW, and a commercial district with a restaurant and shops occurs at the intersection of Otis Place NW and 14th Street NW, potentially contributing to a diverse set of heating and cooling loads. This diversity has value in providing offsetting or canceling thermal loads in networked geothermal systems.

7.1.4. Case Study 4: Deanwood

4A. Neighborhood Description: According to Wikipedia, "Deanwood is a neighborhood in Northeast Washington, D.C., bounded by Eastern Avenue to the northeast, Kenilworth Avenue to the northwest, Division Avenue to the southeast, and Nannie Helen Burroughs Avenue to the south. One of Northeast's oldest neighborhoods, Deanwood's relatively low-density, small wood-frame and brick homes, and dense tree cover give it a small-town character that is unique in the District of Columbia. Much of its housing stock dates from the early 20th century." Fifty-eight percent of buildings in this neighborhood are serviced with gas heating (Pantano et al., 2022).

4B. Leaks: Within the Deanwood neighborhood, leaks were prevalent along 44th Street NE and 45th Street NE (Figure 10). Thus, we focused our study on 45th Street NE between Meade Street NE and Sheriff Road NE, with two leaks; and 44th Street NE between Lee Street NE and Sheriff Road NE, with three leaks. The combined length of both street segments was 2050 feet.

Figure 10. Deanwood focus area. 44th Street NE and 45th Street NW were investigated in this study. Red dots indicate gas leaks detected in Phase 1 report; beige shaded areas indicated areas serviced with gas.

4C. Suspected Pipeline Material and Size:
Mark outs indicated 4” wrapped steel on 44th Street NE, and substandard pipe material of unknown diameter on 45th Street NE. Wrapped steel pipe may be leak-prone. No street markings indicating operating pressure were visible. A full set of documentary photographs were used as the basis of suspected pipeline material and size.

4D. Building Stock: Types of Buildings, Number of Units, Square Footage: The two street segments combined contained 45 buildings, of which 36 were single family homes and 7 multi-family. The total square footage of the buildings on these street segments was 73,580 square feet. Figure 11 shows a typical streetscape and residential buildings, including a mix of newer multi-unit and older historic residential buildings.

Figure 11. Streetscape along 45th Street NE, Deanwood (IDEA Public Charter School on the left).

4E. Estimation of Leak Rates and Associated Carbon Equivalent Emissions, Costs of Leaked Gas: A total of five leaks amounted to an estimated 1150 CFD of leaked natural gas, equivalent to the gas consumption of 5.8 average US households, and a lost value of $16.60 per day, or about $6,060 per year, at current residential gas prices. Using a Global Warming Potential of 29.8 for methane compared to carbon dioxide (Forster et al. 2021), the 1150 CFD of leaked gas is equivalent to 253 metric tons of carbon dioxide (CO2e) per year. For context, this equals about 5.3 average US household total carbon emissions.

4F. Estimated Pipeline Replacement and Repair Cost: The combined street segments total 2050 feet in length, using a $3.2M/mile replacement cost estimate, produces a pipeline replacement estimate of $1.25M for pipeline replacement. Using a repair estimate of $5k per leak (Seavey 2021), leak repair of all leaks would cost $25k.

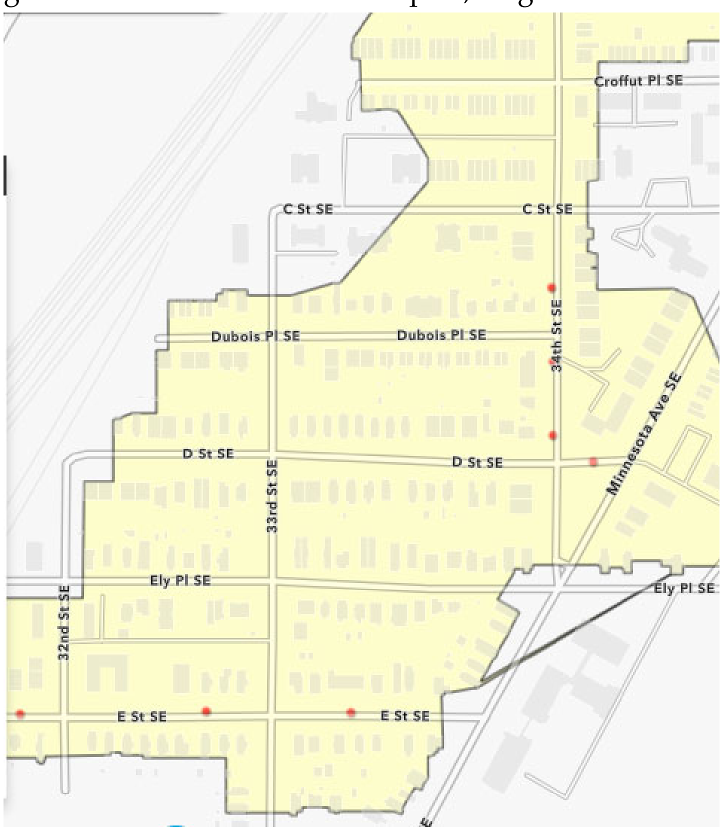
4G. Other Considerations Unique to this Neighborhood: The Deanwood case study streets contain the IDEA Public Charter School, three houses of worship along the two street segments, and an additional two houses of worship which are adjacent to the Charter School and the Peace Fellowship Church on 45th Street NE. We could not find square footage information for the school, and did not include it in our total square footage tally. Additionally, Andrew J Allen Way, an alley, bisects 44th Street NE and 45th Street NE, potentially providing a right of way for electrified heating infrastructure.

7.1.5. Case Study 5: Greenway

5A. Neighborhood Description: According to Wikipedia, "Greenway is a residential neighborhood in Southeast Washington, D.C., in the United States. The neighborhood is bounded by East Capitol Street to the north, Pennsylvania Avenue SE to the south, Interstate 295 to the west, and Minnesota Avenue to the east. The western part of the Greenway neighborhood was marshland and riverbank until a major dredging and land reclamation project by the United States Army Corps of Engineers, begun in the early 1880s, transformed the area into habitable space." Fifty-eight percent of buildings in this neighborhood are serviced with gas heating (Pantano et al., 2022).

5B. Leaks: Within the Greenway neighborhood, leaks were prevalent along 34th Street SE (Figure 12). Thus, we focused our study on this street between Minnesota Avenue SE and B Street SE, with three leaks within that four-block street interval, totaling 1,400 feet.

Figure 12. Greenway focus area. 34th Street SE was investigated in this study. Red dots indicate gas leaks detected in Phase 1 report; beige shaded areas indicated areas serviced with gas.



5C. Suspected Pipeline Material and Size:
Mark outs indicated a suspected 2 inch diameter steel pipe on 34th Street SE. Steel pipe may be leak-prone. Suspected operating pressure was "high pressure." A full set of documentary photographs were used as the basis of suspected pipeline material and size.

5D. Building Stock: Types of Buildings, Number of Units, Square Footage: The portion of 34th Street SE investigated contained 18 buildings, of which 9 were single family homes and 9 multi-family. The total square footage of the buildings on this street segment was 41,670 square feet. Figure 13 shows a typical streetscape and residential buildings, including a mix of newer multi-unit and older historic residential buildings.

Figure 13. Streetscape along 34th Street SE, in the Greenway Neighborhood.

5E. Estimation of Leak Rates and Associated Carbon Equivalent Emissions, Costs of Leaked Gas: A total of three leaks amounted to an estimated 650 CFD of leaked natural gas, equivalent to the gas consumption of 3.3 average US households, and a lost value of \$9.40 per day, or about \$3,400 per year, at current residential gas prices. Using a Global Warming Potential of 29.8 for methane compared to carbon dioxide (Forster et al. 2021), the 650 CFD of leaked gas is equivalent to 143 metric tons of carbon dioxide (CO2e) per year. For context, this equals about 3.0 average US household total carbon emissions.

5F. Estimated Pipeline Replacement and Repair Cost: The street segment of 1400 feet in length, using a \$3.2M/mile replacement cost estimate, produces a pipeline replacement estimate of \$0.85M for pipeline replacement. Using a leak repair estimate of \$5k per leak (Seavey 2021), leak repair of all leaks would cost \$15k.

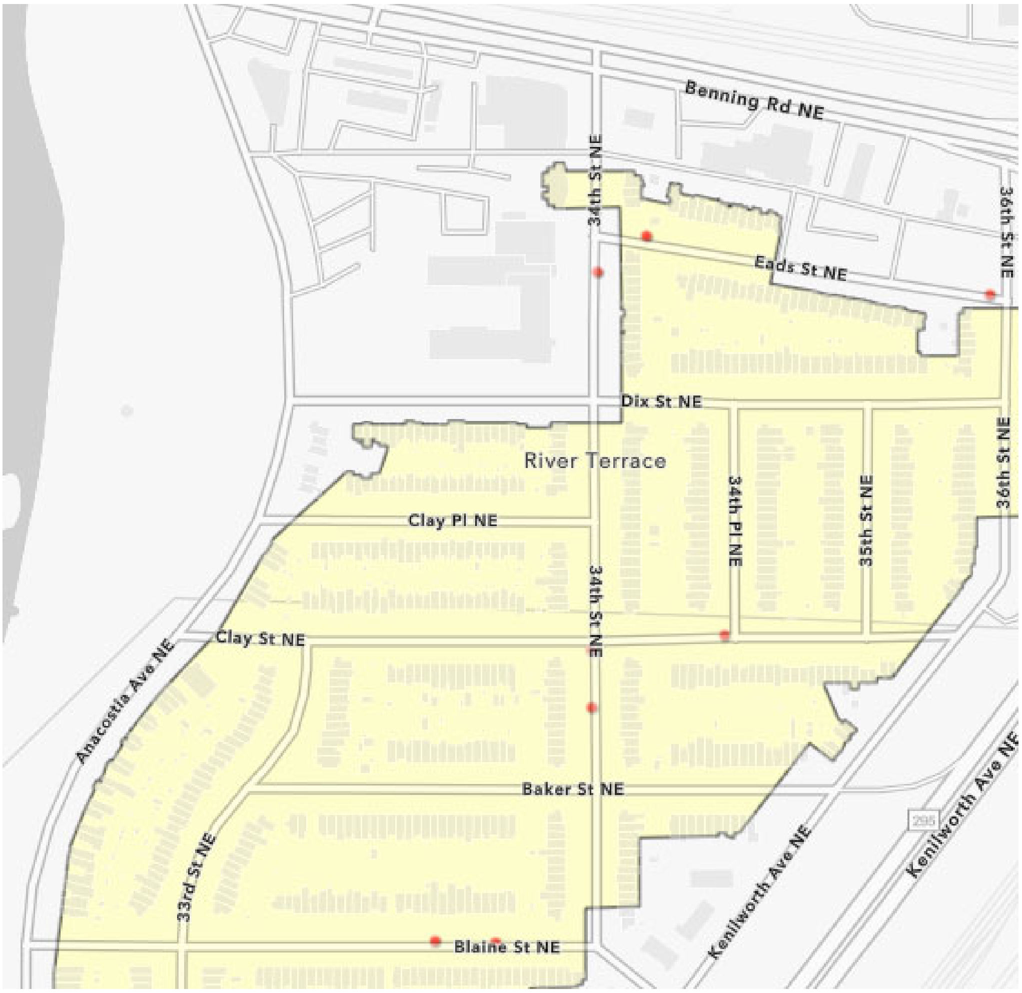
5G. Other Considerations Unique to this Neighborhood: A church and funeral home are located on this street segment.

7.1.6. Case Study 6: River Terrace

6A. Neighborhood Description: According to Wikipedia, “River Terrace is an urban cul-de-sac neighborhood in Northeast Washington, D.C., on the eastern bank of the Anacostia River. River Terrace is Washington, DC's only planned unit development that has an unimpeded connection to and relationship with the Anacostia River. The 2010 U.S. Census reported that River Terrace has a total of 1,962 residents who live in 998 households. In addition to single-family row houses and semi-detached houses, the neighborhood has about 75 rental apartments in 7 low-rise multi-family buildings.” Fifty-eight percent of buildings in this neighborhood are serviced with gas heating Pantano et al., 2022).

6B. Leaks: Within River Terrace, leaks were prevalent along 34th Street NE and Blaine Street NE (Figure 14). Thus we focused our study on 34th Street NE between Blaine Street NE and Benning Road NE, with three leaks; and Blaine Street NE between Anacostia Avenue NE and Kenilworth Avenue NE, with two leaks. Combined street segment lengths totaled 3070 feet.

Figure 14. River Terrace focus area. 34th Street NE and Blaine Street NE were investigated in this study. Red dots indicate gas leaks detected in Phase 1 report; beige shaded areas indicated areas serviced with gas.



6C. Suspected Pipeline Material and Size:
Street markings ("mark-outs") indicated suspected 6" diameter wrapped steel pipe on 34th Street NE and 2" diameter wrapped steel pipe on Blaine Street NE. Wrapped steel pipe may be leak-prone. Suspected operating pressure on both streets was "high". A full set of documentary photographs we used as the basis of suspected pipeline material and size is available to DOEE upon request.

6D. Building Stock: Types of Buildings, Number of Units, Square Footage: 34th Street NE and Blaine Street NE contained a combined 166 buildings, of which all were single family homes. The total square footage of the buildings on these two street segments was 170,825 square feet. Figure 15 shows a typical streetscape and residential buildings.

Figure 15. Streetscape along 34th Street NE, in the River Terrace Neighborhood.

6E. Estimation of Leak Rates and Associated Carbon Equivalent Emissions, Costs of Leaked Gas: A total of five leaks on both street segments amounted to an estimated 740 CFD of leaked natural gas, equivalent to the gas consumption of 3.7 average US households, and a lost value of $10.69 per day, or about $3,900 per year, at current residential gas prices. Using a Global Warming Potential of 29.8 for methane compared to carbon dioxide (Forster et al. 2021), the 740 CFD of leaked gas is equivalent to 163 metric tons of carbon dioxide (CO2e) per year. For context, this equals about 3.4 average US household total carbon emissions.

6F. Estimated Pipeline Replacement and Repair Cost: The street segments totaling 3,070 feet in length, using a $3.2M/mile replacement cost estimate, produces a pipeline replacement estimate of $1.9M for pipeline replacement. Using a repair estimate of $5k per leak (Seavey 2021), leak repair of all leaks would cost $25k.

6G. Other Considerations Unique to this Neighborhood: The River Terrace Education Campus, a DC Public Elementary School, although having a mailing address on neighboring Anacostia Avenue NE, abuts 34th Street NE and could serve as a community anchor for block-scale electrification.

7.1.7. Case Study 7: Woodridge

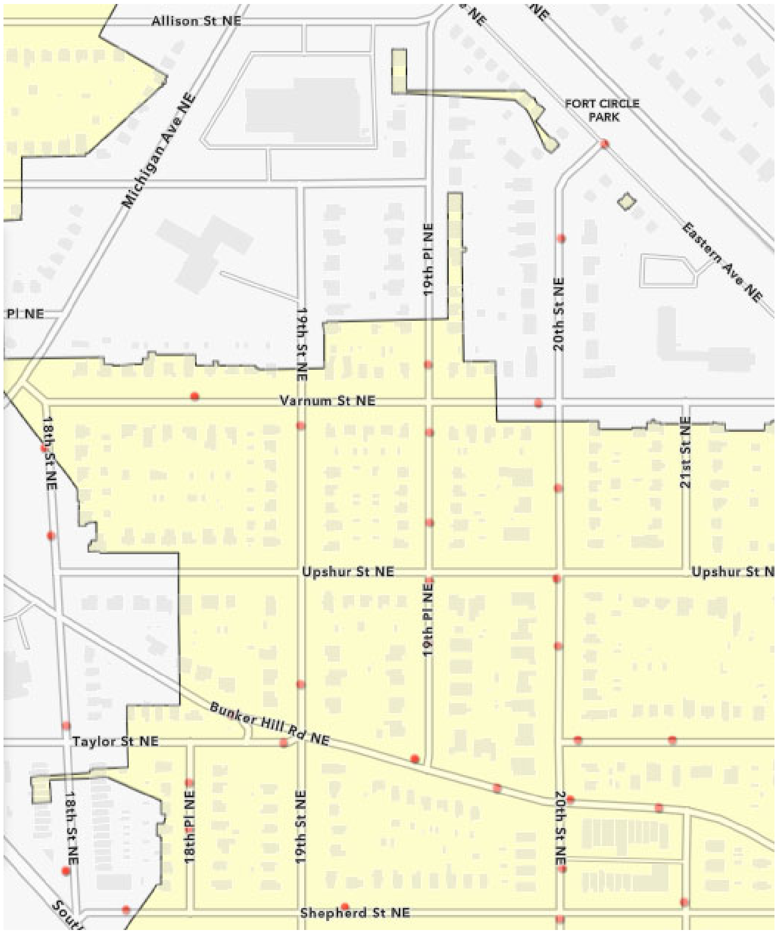
7A. Neighborhood Description: According to Wikipedia, "Woodridge is a residential neighborhood located in Ward 5 of Northeast Washington, D.C. Woodridge is contained between Eastern Avenue N.E. to the east, Taylor Street N.E. to the north, South Dakota Avenue N.E. to the west, and Bladensburg Road N.E. to the south. Its central commercial strips are Rhode Island Avenue NE (Route 1) and Bladensburg Road N.E. Woodridge borders the adjacent neighborhoods of Brookland, Langdon, North Michigan Park, and Fort Lincoln in Northeast Washington D.C. In addition to these neighborhoods in the District of Columbia, Woodridge also borders the city of Mount Rainier and town of Cottage City in Maryland." Fifty-eight percent of buildings in this neighborhood are serviced with gas heating (Pantano et al., 2022).

7B. Leaks: Within the Woodridge neighborhood, leaks were prevalent along 19th Street NE, 19th Place NE, and 20th Street NE (Figure 16). Thus, we focused our study on:

- 19th Street NE between Bunker Hill Road NE and Webster Street NE, with two leaks;
- 19th Place NE between Bunker Hill Road NE and Eastern Avenue NE, with four leaks;
- 20th Street NE, between Bunker Hill Road NE and Eastern Avenue NE, with five leaks.

The combined length of these three streets was 4325 feet.

Figure 16. Woodridge focus area. K Street SE, was investigated in this study. Red dots indicate gas leaks detected in Phase 1 report; beige shaded areas indicated areas serviced with gas.



7C. Suspected Pipeline Material and Size:
Mark outs indicated suspected 6" wrapped steel pipe on 19th Street NE and 19th Place NE, and 6" cast iron pipe on 20th Street NE. Wrapped steel may be leak-prone and cast iron pipe is considered leak-prone. Suspected operating pressure was "low" on 19th Place NE and 20th Street NE, and "high" on 19th Street NE. A full set of documentary photographs were used as the basis of suspected pipeline material and size.

7D. Building Stock: Types of Buildings, Number of Units, Square Footage: The three street segments combined contained 88 buildings, all of which were single family homes. The total square footage of the buildings on the three street segments was 153,548 square feet. Figure 17 shows a typical streetscape and residential buildings, including a mix of newer multi-unit and older historic residential buildings.

Figure 17. Streetscape along 19th Street NE, in the Woodridge neighborhood.

7E. Estimation of Leak Rates and Associated Carbon Equivalent Emissions, Costs of Leaked Gas: A total of 11 leaks* amounted to an estimated 12,100 CFD of leaked natural gas, equivalent to the gas consumption of 61 average US households, and a lost value of $175 per day, or about $64k per year, at current residential gas prices. Using a Global Warming Potential of 29.8 for methane compared to carbon dioxide (Forster et al. 2021), the 12,100 CFD of leaked gas is equivalent to 2670 metric tons of carbon dioxide (CO2e) per year. For context, this equals about 56 average US household total carbon emissions.

---

*In 2022, we discovered the two largest leaks on this street were repaired, discussed later.

7F. Estimated Pipeline Replacement and Repair Cost: The combined length of street segments equaled 4325 feet. Using a $3.2M/mile replacement cost estimate produces a pipeline replacement estimate of $2.6M for pipeline replacement. Using a leak repair estimate of $5k per leak (Seavey 2021), leak repair of all leaks would cost $55k.

7G. Other Considerations Unique to this Neighborhood: The two largest estimated leaks in this neighborhood (and in any of the seven case studies) appeared to be repaired or in the process of repair between the time of our 2021 Phase 1 study and a re-survey we conducted in July, 2022 (Figure 18). Eliminating these two leaks in this portion of the Woodridge neighborhood reduced the total methane leakage rate, lost value, and carbon equivalent emissions by 75% (3,100 CFD from 12,100 CFD; and $16.3k/year from $64k/year in value of leaked gas).

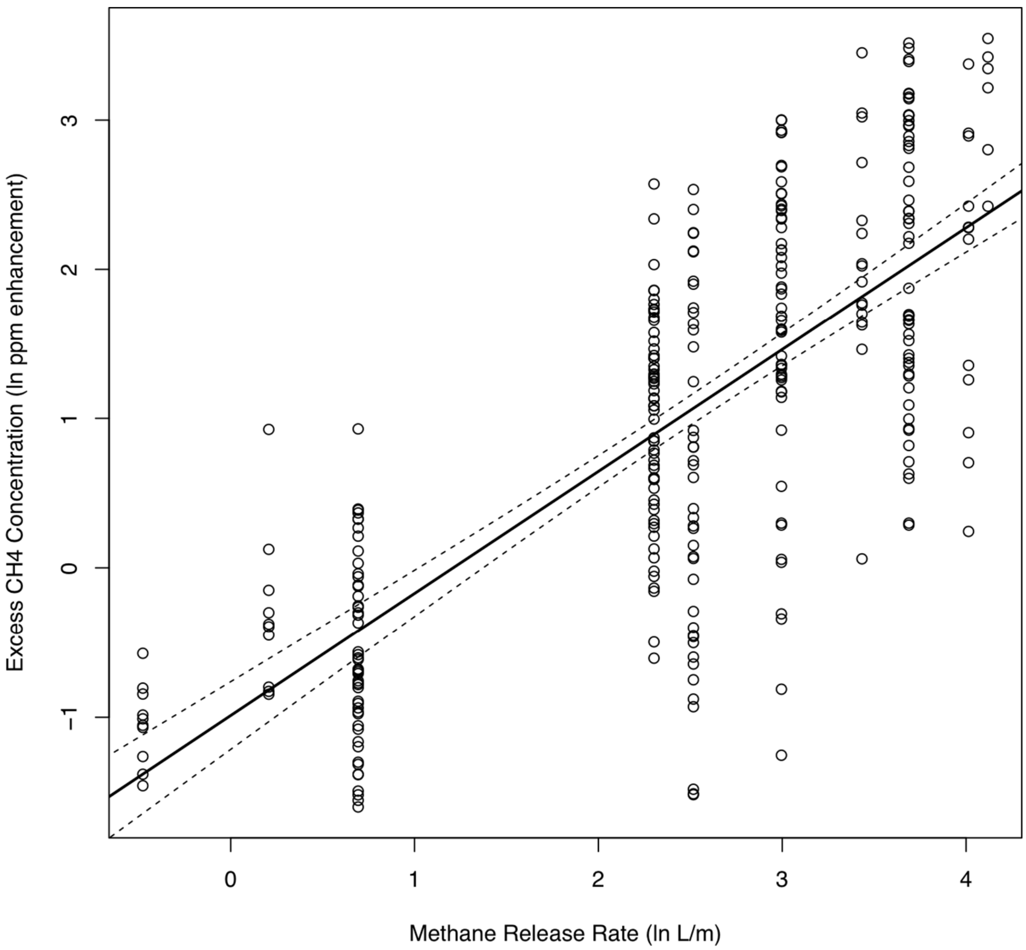
This portion of the Woodridge neighborhood contained three churches either abutting or in close proximity to streets investigated, and a childcare center at the intersection of 20th Street NE and Bunker Hill Road NE.

Figure 18. Evidence of a suspected leak repair and repaving over a 6” cast iron pipe on 20th Street NE. The patch extends from the foreground a distance of approximately 100 feet, ending approximately between the white van and the vehicle parked behind it on the right. The yellow mark-out paint indicates the planar-view location of the gas main. A re-survey in 2022 found that this patch and additional work on this street repaired the two largest leaks among the 11 leaks in this neighborhood. A narrated video of the repair work is available here.

7.2. Appendix 2. Methane Leak Flux Estimation and Cost of Gas Estimates

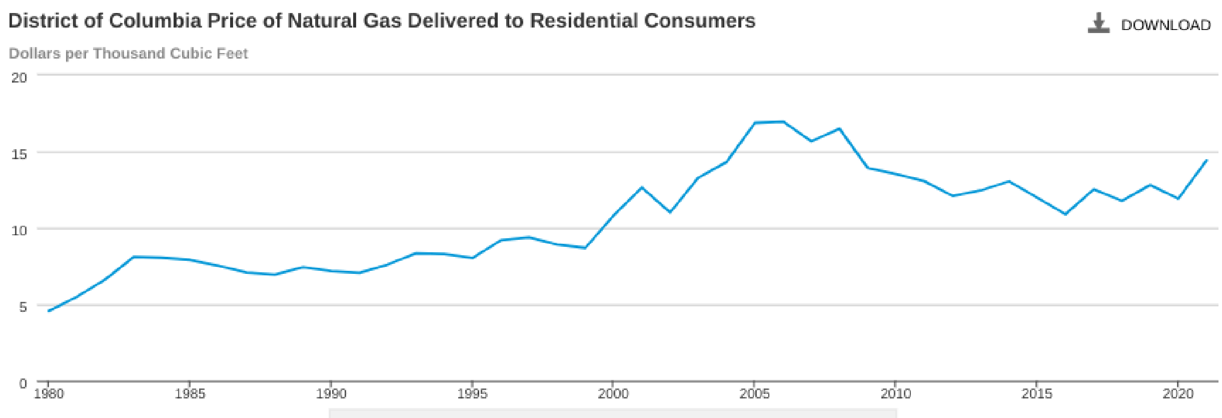
We utilized a peer-reviewed method suitable for our application, by Weller et al. (2019). Building on prior work of Von Fischer et al. (2017), Weller et al. produced a relationship between independently metered methane releases, simulating leaks with known leak rates (horizontal axis in Figure 17) and peak methane concentrations detected in air (vertical axis in Figure 17), from mobile surveys using the same instrumentation and basic sampling/mapping configuration in a vehicle as in our Phase 1 mobile gas leak survey. This method is both widely applicable across leak sizes (as both horizontal and vertical axes are logarithmic, spanning several orders of magnitude in size), and also characterized by large variability or scatter in the data. These features indicate that this estimation method is appropriate for studies with an objective to differentiate leak sizes by orders of magnitude, but not to find small differences in size between leaks of the same order of magnitude of size. For the purpose of finding and estimating the size of “super-emitters” in this Phase 2 study, this method was well-suited for our needs.

Figure 17: Relationship between excess methane concentrations in air (vertical axis) and methane flux (horizontal axis). Figure reproduced from Weller et al. (2019) under the Creative Commons Attribution License.



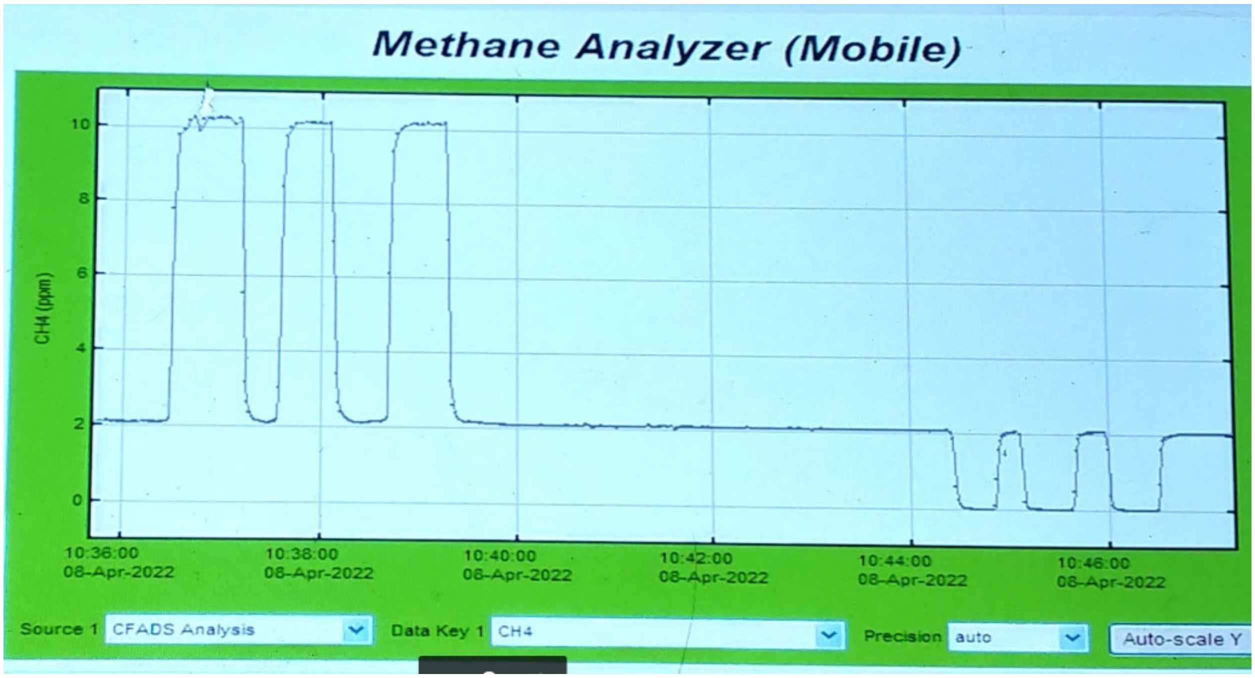
In this report we specify estimated emissions and other quantitative data at a precision of no more than two significant digits because of the order-of-magnitude precision of our methane flux estimation method as described above, and because of similar uncertainty in cost estimates of the cost of gas, pipeline repair, and pipeline replacement. For example, the residential price of natural gas has varied by a factor of three over the last four decades and shows substantial volatility over the last decade (Figure 18). Values reported here should thus be taken as nominal values subject to change, but we do not expect the large cost ratio of repair to replacement to change dramatically in the foreseeable future, especially as trends in pipe replacement have been to cost more, not less, over years.

Figure 18. Residential price of natural gas in the District of Columbia from 1980-2021. Data from the US Energy Information Administration. The price used in this report is the 2021 annual price in DC of $14.43/1000 cubic feet. (https://www.eia.gov/dnav/ng/hist/n3010dc3A.htm)



7.3. Appendix 3. Example Instrument Calibration Check

This screen capture on April 8, 2022, from our mobile car-mounted methane analyzer shows a typical check on analyzer performance against standard calibration tanks of 10.0 ppm methane (three high stable intervals on left part of graph); three checks on 2.0 ppm methane in center of graph (difficult to see on plot since background is approximately 2.0 ppm; and three stable intervals settling on 0.0 ppm methane (lowest readings on right side of graph). Our analyzer was checked against these calibration tanks two additional times during our 2022 sampling dates, with similar performance. While methane concentration data analyzed for this report is based on our 2021 Phase 1 report, we verified the presence or repair of leaks in Phase 2 with this analyzer, and report this calibration check to confirm the accuracy of our analyzer.


Methane Analyzer (Mobile)
CH4 (ppm)
0
2
4
6
8
10
10:36:00 08-Apr-2022
10:38:00 08-Apr-2022
10:40:00 08-Apr-2022
10:42:00 08-Apr-2022
10:44:00 08-Apr-2022
10:46:00 08-Apr-2022
Source 1
CFADS Analysis
Data Key 1
CH4
Precision
auto
Auto-scale Y

ATTACHMENT A

2021 Fugitive Methane Emission Survey of the District of Columbia

For the District of Columbia Department of Energy and Environment

October 31, 2021

Bob Ackley
Gas Safety, USA
16 Brook Lane, Southborough, MA 01772
robert.c.ackley@gmail.com
508-344-9321

Nathan Phillips
Department of Earth and Environment
Boston University
685 Commonwealth Avenue
Boston, MA 02215
nathan@bu.edu
617-997-1057

Table of Contents

ATTACHMENT A

Executive Summary by the Department of Energy and Environment

The purpose of this study is to initiate the first part of an overall study by the Department of Energy and Environment (DOEE) to understand how best to reduce methane emissions associated with the use of natural gas in the District and how such reductions may occur cost-effectively. This first part is a preliminary survey of where fugitive methane emissions may be occurring, and, more importantly, to identify where such emissions may become a concern from a climate change mitigation perspective, due to their potential for high-volume emissions.

It should be emphasized that the scope of this survey does not include an evaluation of safety. Safety determinations are made by Washington Gas using their site-specific criteria for identifying safety risks, and they are outside the scope of the survey. Air methane concentration readings that were obtained in this survey, whether low or high, are not intended to serve as indicators of safety or hazardousness.

Leaks from natural gas infrastructure contribute to climate change, damage trees, create potential safety risks, degrade air quality, and waste ratepayer money. Identifying the locations of high-volume leaks can help reduce GHG emissions effectively, and understanding where leaks may be occurring can inform policy development for a strategic and manageable transition toward decarbonized heating.

The technical consultants performed a methane (CH_4) emission survey of residential neighborhoods in the District of Columbia, during April - June, 2021. They used a high-precision, vehicle-mounted methane analyzer equipped with a Global Positioning System, to survey and map surface methane emissions detected across 713 centerline miles in the District. They identified 3,346 locations where the analyzer detected methane at concentration levels higher than ambient background levels. Methane can come from sources other than natural gas pipelines, including broken sewer mains, landfills, and wetlands. Therefore, this study established strong correlations of identified methane emission points to natural gas pipes: they verified a sample set of vehicle-detected air methane concentration readings with subsurface measurements of combustible gas. For this sample set, every methane emission point they verified in the subsurface was in close spatial proximity to a natural gas main, valve, or service line, indicating that the detected methane emission points are overwhelmingly caused by leaking natural gas infrastructure. These detections take into account the naturally-occurring ambient background levels of methane, which can vary by location and time of day due to wind conditions as well as proximity of methane emission points to analyzer.

Based on this survey and in its subsequent analyses, DOEE will prioritize the identification of leak locations that have the potential to produce high-volume emissions. Scientific studies on methane leaks from natural gas distribution systems suggest that a small percentage of the overall number of leaks in a given system may be responsible for a majority of the overall volume of the leaks from the system. For example, for the gas distribution system in Boston, 7% of the leaks were shown to be contributing 50% of the total methane emissions that were measured. Therefore, DOEE presumes that of the 3,346 locations of fugitive methane emissions that were detected in this survey, a relatively small percentage of those locations may be contributing a large portion of the overall fugitive emissions from the system, and DOEE will further investigate the emissions at those locations to quantify the volume of emissions. Air methane concentration levels alone are not a reliable indicator of the overall volume of fugitive emissions, which requires further analysis, and various methods for estimating the volume of emissions are described in the report. The overall numbers are equivalent to a frequency of about 4.7 methane emission points per centerline road mile, with some of the older neighborhoods showing a higher frequency.

We emphasize that while it makes good sense to prioritize and further analyze and address the high-volume locations with high air methane concentration level readings, it must be remembered that a leak extent analysis could show some leaks with low air methane concentration level readings can also produce high volumes of emissions.

Acknowledgements: The report authors thank Dominic Nicholas for performing algorithm development, programming, data processing and analysis, GIS mapping and data visualization; and Julian Phillips for providing vehicle navigation support and graphics support. Gas Safety, Inc., and Nathan Phillips are wholly responsible for the content and data reported herein.

1. Introduction

Leaks from natural gas infrastructure constitute problems across a wide spatial range. At the point of a leak, methane (CH_4), the largest constituent of natural gas, can build up in confined spaces to hazardous levels. Near the point of a gas leak, gas displaces oxygen in soils, damaging vegetation including trees (Schoellart et al. 2020). At the scale of communities, gas leaks degrade air quality, promoting the formation of surface level ozone and formaldehyde, both of which are damaging to health (West et al. 2006). At the global scale, gas leaks contribute to climate change, as the largest constituent of natural gas, methane, is a powerful greenhouse gas (IPCC 2013). Finally, gas leaks represent lost ratepayer money. In 2019, the most recent reporting year, the District of Columbia had the highest percent lost gas[1] (6.2%) among the US states and the District of Columbia. The volume of lost gas in 2019 (19 million therms), at a nominal price of natural gas in the District of $1.25/therm, represents a lost value of approximately $24M.

Most gas leaks in the pipeline distribution systems in cities and towns are associated with old, leak-prone pipe, some over a century old, of which cities along the US eastern seaboard have relatively large proportions. In 2013, we published the first study of its kind, detecting and mapping 3,356 gas leaks from natural gas distribution pipeline infrastructure in Boston, MA (Phillips et al., 2013). In 2014, this same team conducted and published a study documenting 5,893 gas leaks across approximately 1,500 centerline road miles of the District of Columbia (Jackson et al., 2014). The study reported here focuses on residential sections of the District of Columbia, serviced by gas, for the D.C. Department of Energy and Environment.

2. Context

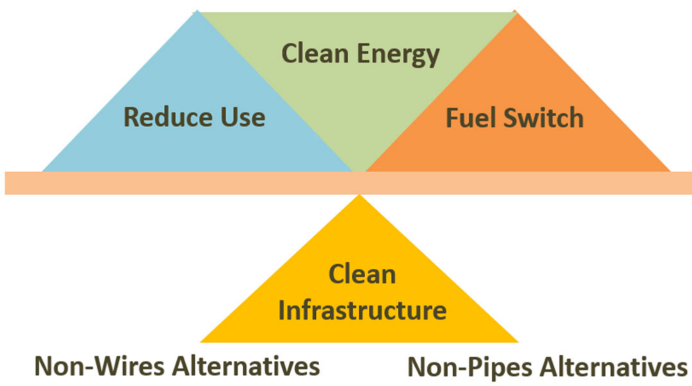
This study is conducted to help advance the District Government's building decarbonization policy, and to inform DOEE's ongoing intervention in Formal Cases 1154 and 1167 regarding, respectively, Washington Gas's pipe replacement program called PROJECTpipes (currently in Phase 2)[2] and climate change programs. The District of Columbia is committed to doing its part to meet the challenge, as described in the 2015 Paris Climate Accord, of keeping the rise of

---

[1] "Lost Gas" is defined by the US Energy Information Administration as "known volumes of natural gas that were the result of leaks, damage, accidents, migration, and/or blow down within the State in which these events took place.

[2] The purpose of PROJECTpipes is not about identifying and fixing actual leaks that are occurring, and Washington Gas already has a leak repair program. Rather, the purpose is to prevent or mitigate *potential future* leaks by replacing all pipes without accounting for building electrification. Furthermore, the method of prioritizing pipes for replacement is based on an algorithmic forecast of potential future leaks, meaning that some of the pipes targeted for replacement may not be leaking at all currently and may go unused in a future of all-electric buildings.

global warming to well below 2^{o}C from pre-industrial levels and to pursue efforts to limit the increase to 1.5 ^{o}C. Achieving this goal requires that the world reach carbon neutrality around 2050, and DOEE's Clean Energy DC Plan noted that hitting the 2050 GHG carbon neutral target will require the District to eliminate fossil fuel use:[3]



The District's decarbonization policy rests on the three pillars of energy use reduction, clean energy supply, and fuel switching, and these pillars in turn rely on the availability of clean energy delivery infrastructure.[4] This means, for the electricity infrastructure, a modernized grid that maximizes and promotes the use of Distributed Energy Resources and microgrids, and, for the natural gas system, it means prudently downsizing—via strategies such as non-pipe alternatives--the pipe system to minimize the stranded costs caused by building decarbonization, and to eliminate leaks emitting high volumes of methane.

In Formal Case 1167, DOEE commented that Washington Gas's climate business plan proposes selling natural gas for space heating and cooking well past 2050, premised on a completely replaced pipe system, which are contrary to the District's decarbonization efforts. Similarly, in Formal Case 1154, DOEE testified that PROJECTpipes will result in very small reductions of GHG emissions despite the high cost of the program (an overall cost ranging from $3 billion to $4.5 billion by 2055). PROJECTpipes doubles down on an infrastructure designed to deliver fossil fuels when District policies and market trends are rapidly moving away from the use of fossil fuels in buildings.[5] DOEE testified that building electrification be considered as a non-pipe alternative, similar to the non-wire alternative using distributed energy resources in the electricity sector, to PROJECTpipes. DOEE recommended in its testimony that to reduce the

---

[3] Clean Energy DC, p. 156. Specifically, the Clean Energy DC plan states that achieving the District's 2050 GHG carbon neutral target will require the District to phase out the use of natural gas in buildings. Therefore it is readily apparent that the Company's effort to completely rebuild a natural gas delivery system by 2054 with $3 - $4.5 billion in ratepayer funds is directly at odds with the District's climate goals.

[4] See Clean Energy DC Plan, "Transforming to a Low Carbon District".

[5] See Clean Energy DC Plan, p.24, p.156:

> To achieve its 2032 GHG target, the District will clearly need to shift away from fossil fuels for buildings (natural gas and fuel oil) and transportation (gasoline and diesel) while simultaneously decarbonizing its electricity supply. For buildings, this will mean shifting to non-fossil fuel sources for heat and hot water. …. Consequently, the District must transition away from equipment and technologies that currently depend on such fuels. The equipment used to heat and cool space and water in buildings is a key aspect of this transition.

future risks of pipe leaks, (1) all of the leaks in the District be mapped using high-sensitivity leak detectors, then (2) prioritize the replacement of pipes based on the map's findings, first exploring the viability of the Non-Pipe Alternative approach. This study furthers these decarbonization objectives, and it helps to identify critical issues related to human health and equity associated with the use of fossil fuel appliances.

3. Scope of Work

We surveyed surface methane emission points on public roads in selected residential areas of the District of Columbia as specified by the Department of Energy and Environment (Figure 1). Methane can come from sources other than natural gas pipelines, including broken sewer mains, landfills, and wetlands. Therefore, this study detected methane leaks as a broader category than natural gas leaks, and it was necessary to establish strong correlations of identified emissions points to natural gas pipes.

Our prior work in Boston and the District of Columbia showed that the vast majority of leaks detected from under streets and sidewalks bore a distinct chemical signature of natural gas methane (Jackson et al. 2014; Phillips et al. 2013). Moreover, the spatial signature of wetland and landfill leaks is distinctly different from that of pipeline leaks. Fugitive emissions from leaky pipes are recognizable as abrupt and highly localized spikes in methane concentration, whereas wetland and landfill methane emissions manifest as sloping, gradual deviations from a baseline methane concentration.

To ensure that the identified fugitive methane emissions emanated from natural gas pipes, we verified the source of emissions detected in our mobile survey, by investigating a subsample of detected fugitive emissions from the mobile survey using a hand-held combustible gas indicator with subsurface probe, walking the vicinity of detected locations in air to verify whether they were spatially associated with subsurface gas near natural gas pipeline infrastructure. Secondarily, we verified whether methane emissions were from gas pipelines by detecting the odor of the mercaptan odorant added to pipeline gas.

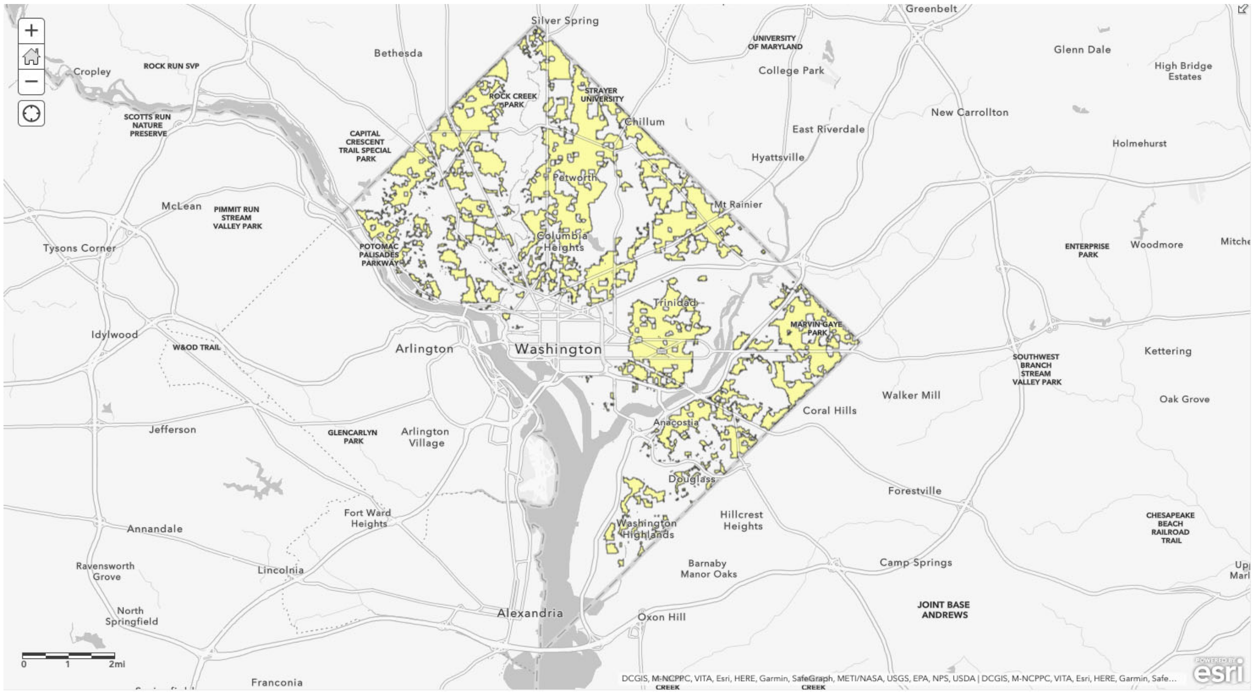


Figure 1. Areas (in yellow) of the District of Columbia specified by DOEE to be surveyed for methane leaks along public roads.

Our road methane emission survey covered approximately 99% of the public roads in the specified areas of the District (Figure 2), covering 713 centerline road miles, in accordance with DOEE's need to address the climate change and health impacts of methane leaks in residential neighborhoods.   Reasons for not surveying 100% of public roads in residential neighborhoods included protracted road work, and recent pedestrianization of some streets.

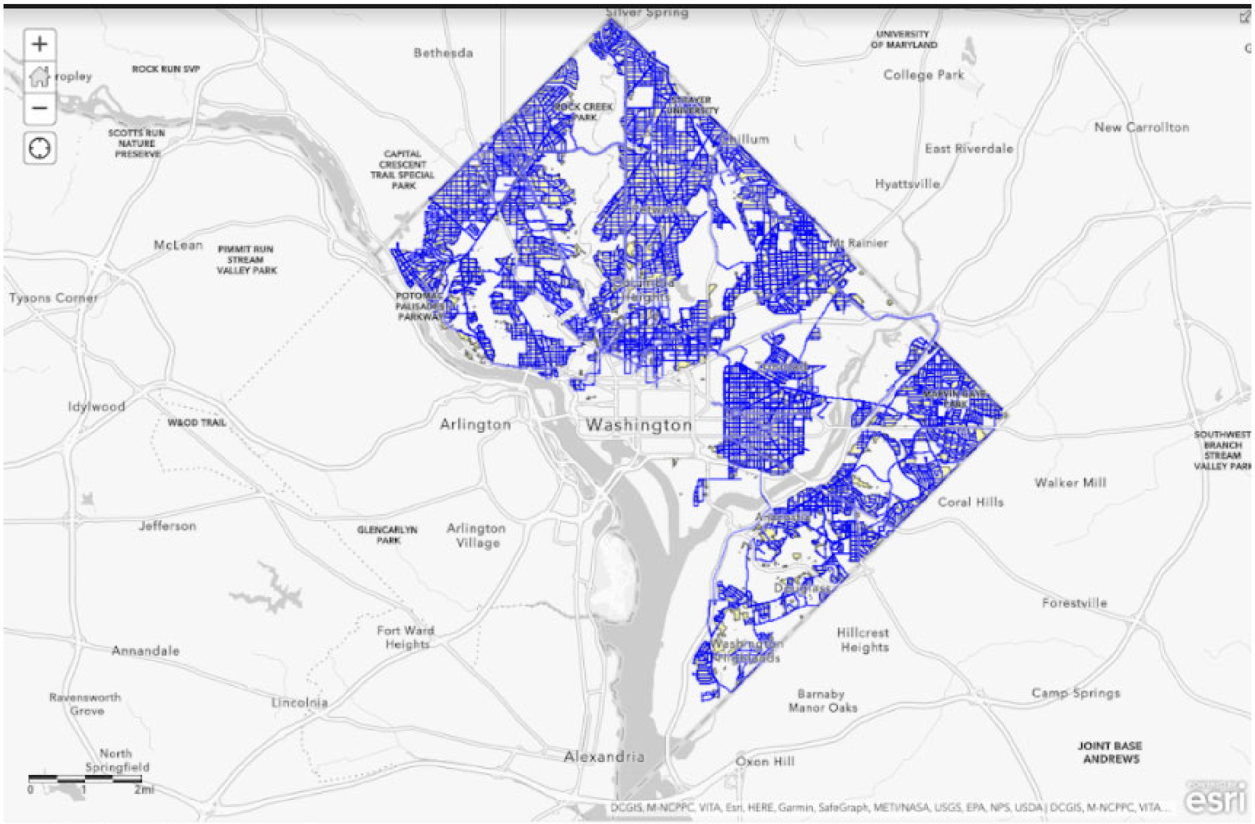


Figure 2. Roads Driven and surveyed for methane leaks between April and June 2021, overlain on the specified areas depicted in yellow and Figure 1.

It is important to recognize that peak concentration data typically, but do not automatically nor reliably lead to the rate of methane volume emitted from each leak. This is due to a combined effect of variable proximity of each leak to the analyzer inlet as it is driven past, and to vagaries of wind that could blow a leak plume in any direction while the analyzer is being driven past it. For this reason, we traveled every road in the specified areas of interest at least twice. Although the combination of leak proximity to analyzer and wind conditions do not often create "all things being equal" conditions, it is the case that when all conditions *are* equal or at least similar, a higher peak concentration in a plume indicates a larger leak, so the higher peak concentration leaks do provide useful information as an initial indication of potentially large leaks, which, however, necessitate follow-up on-the-ground measurements to confirm.

For an estimate of the volume flux of methane emitted from each leak, a future, second phase of this research will be needed. There are several potential approaches to quantifying the volume of or categorizing the size of individual gas leaks. These approaches fall into three general categories: 1) ground-based measurements of gas emanating from the surface (e.g., Hendrick et al. 2016); 2) meteorological measurement and modeling of the size and movement of gas plumes using wind speed and direction measurements (e.g., Jackson et al. 2014; von

Fischer et al. 2017); and 3) plume spectroscopic methods that measure the absorption of radiation by methane plumes (described in Magavi 2018).

Each of the leak quantification methods has pros and cons. Ground-based measurements using chambers, as in Hendrick et al. (2016), provide direct, relatively accurate quantification of leaks using simple measurements, but is a laborious and time-consuming process, which can take many hours per leak. “Plume mapper” approaches similar to those described in Jackson et al. (2014) and von Fischer et al. (2017) are efficient methods to bin leaks into categorical sizes, but they rely on statistical models of leak size that are developed on a separate test set of leaks that may not represent the same geometric complexity of streetscapes or spatially complex leak loss points. The spectroscopic method described in Magavi (2018) is in principle the easiest and most reliably integrative of the entirety of a leak in space, as it simply uses and measures focused light passing through an entire plume, but this method is still in the research and development phase.

A variant on the ground-based method called the “leak extent method”, described in Magavi (2018) and Magavi et al. (2019), consists of making simple estimates of leak size based on the leak square footage. This is an operationally efficient surrogate method to determine leak size category (small, medium, large) based on simple subsurface measurements determining the areal extent of the presence of subsurface gas associated with a leak.

Our research team is equipped for and skilled in making any or a combination of the techniques described above (except for the plume spectroscopic method), in a second phase of this study.

4. Results and Discussion

We detected methane in 3,346 surface locations that exceeded background levels of methane in air across the residential areas of the District of Columbia. The table below shows the overall number of detections by District Wards. Using a statistical sample, we subsequently verified that most of these emissions were coming from the natural gas delivery system.

Ward	# of surface methane emission points above background levels
1	218
2	288
3	595
4	691
5	523
6	554
7	309
8	160

The report includes an Attachment A of the identified methane emission locations and the associated concentration levels that are indicated in quintiles. DOEE can provide the numerical values associated with each location upon specific locational request. The spatial density of methane emission points appeared to be relatively evenly distributed across the study areas. In addition to the point locations, leak density variation, which may be useful in policy decisions on addressing leaks at the street or neighborhood scale, are shown in Figure 3.

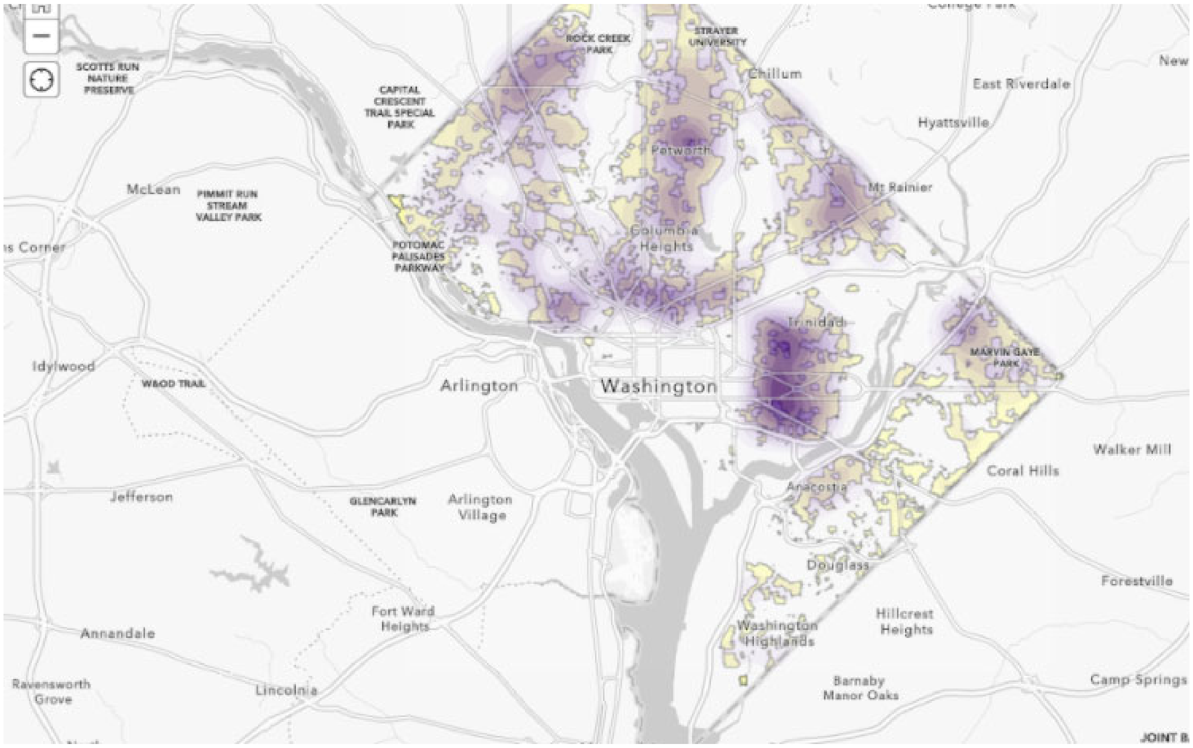


Figure 3. Density of methane emission point distributions.

For verification, forty emission points were selected based on preliminary observations of point [CH_4] elevations, distributed across the District and representing small, medium and large observed methane concentrations (Figure 4). The verification method is explained in Appendix 1. We identified elevated subsurface methane in 39 of the 40 locations, and in every one of the locations in which elevated subsurface methane was found, it was closely spatially associated with a gas main, valve, or service line. Individual reports for each of the 40 verifications are available upon request. These results indicate that analyzer sensitivity to natural gas leaks is high, even for small ones or those that may originate on service lines under sidewalks and yards, or from building meters.

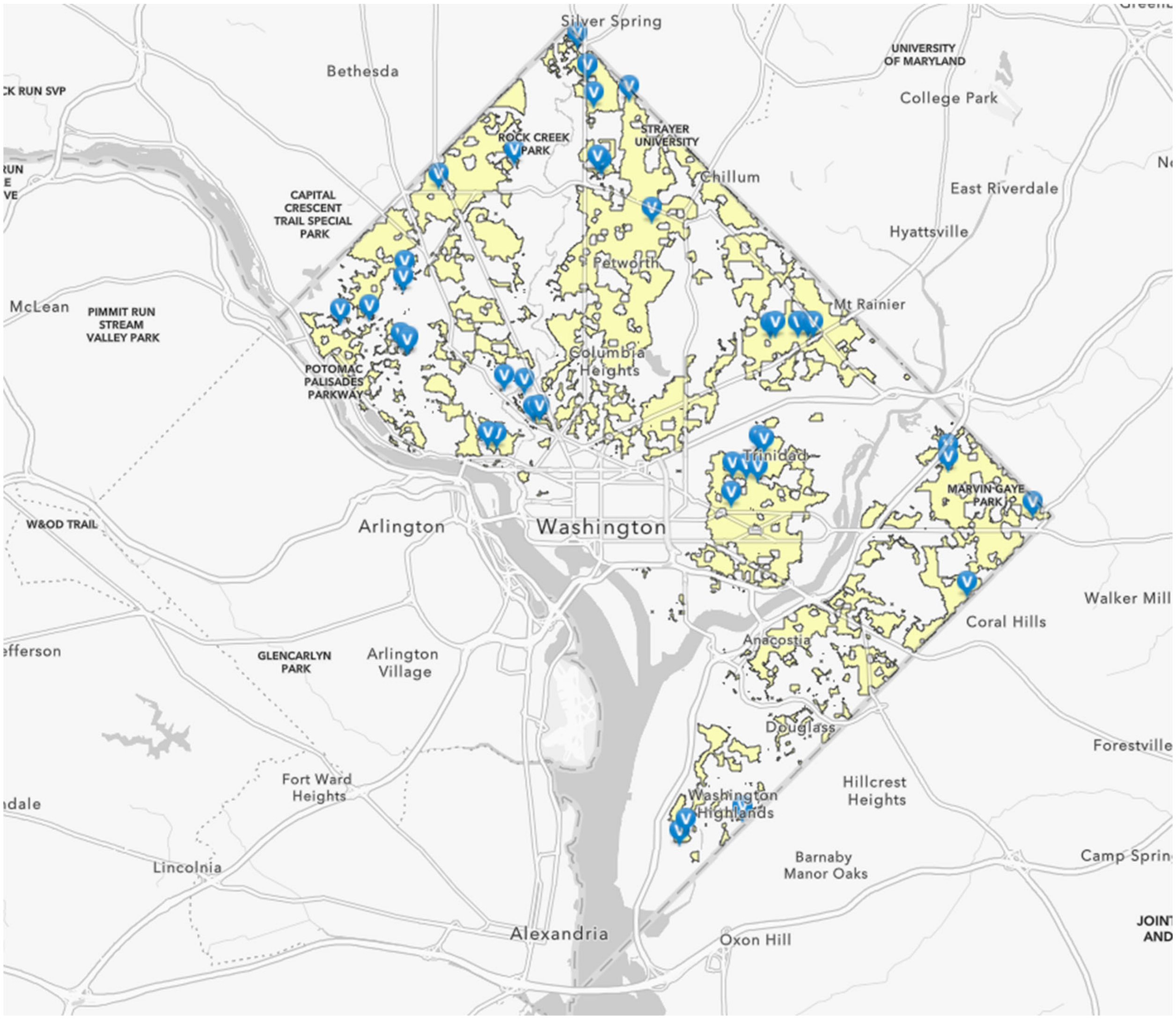


Figure 4. Location of forty leak verifications. A combustible gas indicator with subsurface probe was used to find subsurface leak origins associated with leaks detected by the mobile survey.

Future improvements on this study would include obtaining the complete pipeline inventory and map, and a map of the operating pressures of the pipes in the District of Columbia, from Washington Gas. These data would help explain why certain roadways in the District had a higher spatial density of leaks than others, and it would allow for an estimate of the likely rankings of leak rates from particular lengths of pipeline. Among the low-pressure distribution pipelines, operating pressures can vary substantially, from 0.5 psi to 90 psi or more. Generally, all things being equal, a leak in a pipe will leak at a rate that is proportional to the pipeline operating pressure, so leaks we found in zones of higher operating pressure will be expected to leak at higher rates.

Although peak methane concentrations observed from the mobile survey offer a rough indication of leak size, it is itself not a reliable indicator of leak sizes because of the vagaries of wind speed and direction that make the peak concentrations vary from second to second, and from one drive-by to another. Moreover, a mobile survey is unable to determine the actual distance of the leak from the air inlet collection point, as a large, distant leak could potentially appear similar, under certain wind conditions, to a small, near leak. Therefore, a leak sizing study, using one of the enumerated methods described earlier in this document, should be performed, using the one that is best suited for furthering the objectives concerning the District's climate change and health policies.

We emphasize that while it makes good sense to prioritize and further analyze and address the locations with very high air methane concentration level readings, it must be remembered that a leak extent analysis could show that some leaks with low air methane concentration level readings produce high volumes of emissions.

Appendix 1: Materials and Methods

We used a mobile Picarro G2301 Cavity Ring-Down Spectrometer (Picarro, Inc., Santa Clara, CA; http://www.picarro.com/) in all surveys, installed in a vehicle equipped with a geographic positioning system (GPS), and driven on the specified roads. A filtered inlet tube was placed outside the passenger side of the vehicle. The analyzer was periodically tested with <0.01 ppmv, 2.0 ppmv, and 10 ppmv [CH_4] test gas (Scott Marrin, Inc. Riverside, CA). Further detail is provided below and Figure 8 shows analyzer test results.

To determine the lag time between when air was drawn into the filtered inlet and detected by the analyzer, we used a 50 ppm concentration tank of methane to impart a known methane signal at a specified location, driving at a range of speeds typical of actual survey speeds. We determined a lag time of 4.4 seconds (or, 4 records in the data files) best spatially aligned the detected methane signal with its known location.

As roadways in the town being surveyed are driven, the system records parts per billion (ppb) CH4 concentration each 1.1 seconds, along with latitude-longitude GPS coordinates. Per the lag test described above, in each data file we shifted the apparent GPS location four rows to correct for the 4.4 second time lag between surface methane emission location and analyzer detection.

We started and stopped recording data into individual files representing survey micro-areas likely to have similar ambient conditions, and therefore the DC survey resulted in many individual files of [CH_4] readings by geo-position. The DC survey produced 282 data files over 23 days between April 5 and June 26, 2021. Of these 282 files, 176 were used in this analysis, the remainder being extraneous (e.g., files started and ended in a stopped location).

To distinguish discrete leaks from the spatially continuous raw methane concentration data, a modified Tau approach (Keyes et al. 2020; Olewuezi et al., 2015) was used to perform outlier detection on the raw spatial methane concentration data. This method is a statistical approach to support deciding whether to keep or discard suspected outliers in a population sample, in this case an individual [CH_4] measurement. A threshold methane level that meets the outlier category, indicating a leak, is calculated by the data file's CH_4 sample size, sample average, sample standard deviation, and desired confidence level.

To avoid double-counting methane emission points that were driven past multiple times, a procedure was used to eliminate multiple outliers within a spatial window of 30 m radius from the highest peak methane concentration in the vicinity. Since vehicle lane widths are generally approximately 10 m or less, the 30-meter window is large enough to prevent double-counting but small enough to avoid incorrectly combining separate observed leaks into one.

To test the accuracy of our leak detection, we verified gas in the subsurface, using a handheld Combustible Gas Indicator and probe, from a selection of methane emission points representing small, medium, and large peak concentrations observed across the District. To determine the number of methane emission points to test, we determined to accept a nominal error rate of less than or equal to 5% - that is, that we would accept a “false positive” (assigning a leak where there was none) in less than or equal to 5% of leaks we detected. Practically speaking, this required us to assess at least 20 putatively-detected methane emission points to find if at least one of those emission points did not actually exist as proven by detection of subsurface gas using a hand held probe. In our first 20 emission points, we verified 100% of the detected emissions corresponded to the presence of gas in the subsurface within 30 meters of where our car-based analyzer detected the elevated methane concentrations. We decided to continue to verify detected emission points until we found our first “false positive”, so that we could identify our first non-zero false positive rate. Our 40th reading was a false positive, producing a first false positive rate of 2.5%, at which point we concluded this test as having a satisfactory outcome.

The materials and methods used in this study were similar to those we used in our previous study of methane leaks in the District of Columbia (Jackson et al. 2014), including that both studies used a GPS-equipped Cavity Ringdown Spectrometer mounted in a car. There were two small but important differences in the methods used in the 2014 study and this one. First, the combination of pump speed differences and lengths of the sample tubing from the analyzer to the inlet outside the vehicle differed from that used in a different vehicle and analyzer air pump of the 2014 study, so that the measured, repeatable, and time shift-adjusted lag between injection of a known methane source and detection by the analyzer was 4.4 seconds in this study as compared to ~1 second in Jackson et al. (2014). Secondly, while the 2014 study used an air inlet point ~ 0.5 m above the road surface, this study placed the inlet at ~ 1.0 m above the road surface. This was an intentional decision to provide us with the ability to detect methane leaks from a wider spatial extent than in the 2014 study, as sampling from a greater vertical distance above ground is akin to having a wider scope of view. This decision follows from our improved sensitivity in leak detection we have published subsequent to the 2014 study (Keyes et al., 2020). The expected and observed effect of this methodological change was that the plumes from the methane leaks we detected from 1.0 m above the road surface were characterized by lower peak concentrations than the plumes from leaks observed at ~ 0.5 m above the road surface in the 2014 study.

Instrument calibration checks:

We tested the analyzer prior to the beginning of the survey (March 30, 2021); during a midpoint of the survey (April 19, 2021), and near the conclusion of the survey (June 23, 2021), against nominal 0.0 ppm; 2.0 ppm and 10 ppm test gases in ultrapure air. The test gas tanks were certified to contain < 0.01 ppm; 2.072 ppm; and 10.32 ppm, respectively (+/- 1% NIST). The test results are shown in Figure 8. These results demonstrate that our analyzer was working properly and with adequate precision for the study.

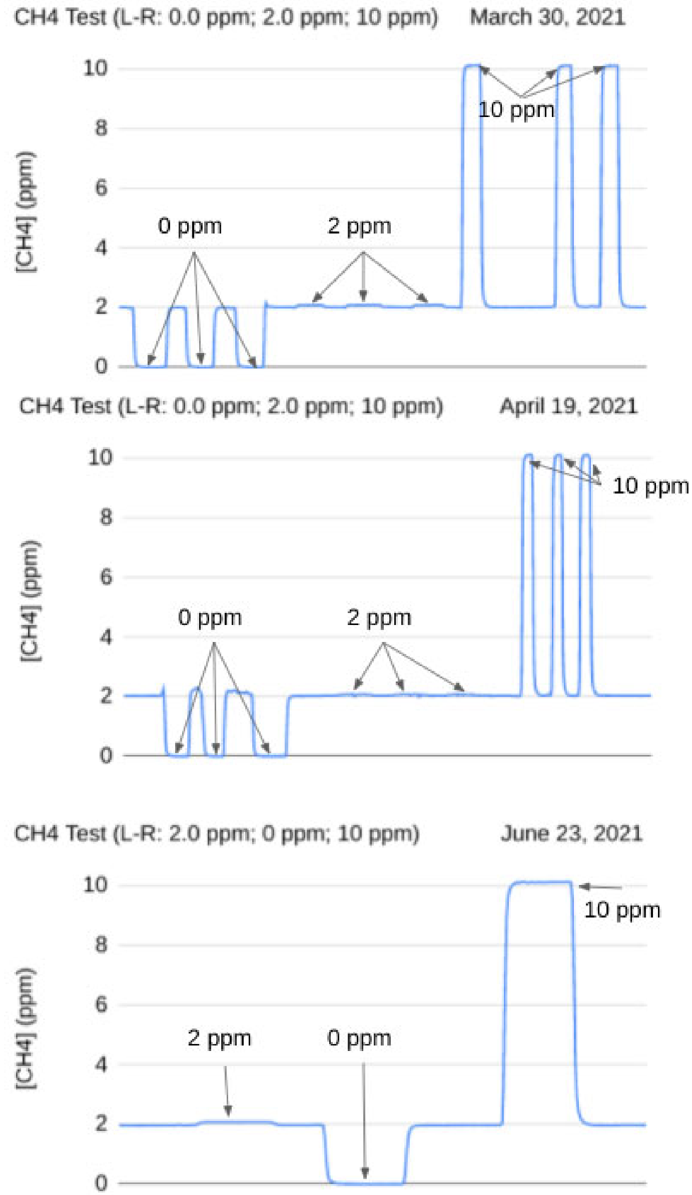


Figure 6. Analyzer calibration checks prior to (top), during (middle) and toward the end (bottom) of the methane leak survey. Triple checks at each of three standards were made in the first two dates and a single check at each of three concentrations was made in the final check.

Appendix 2: Gas Leak Classification

Gas leaks upon detection have traditionally been classified into three categories with each category requiring different repair requirements and timelines. For Washington Gas's leak classification and reporting, please refer to D.C. Municipal Regulations, Title 15, Chapter 37, Reporting and Repairing Requirements for Gas Leaks and Odor Complaints

Appendix 3: References Cited

Hendrick MF, Ackley R, Sanaie-Movahed B, Tang X, Phillips NG (2016) Fugitive methane emissions from leak-prone natural gas distribution infrastructure in urban environments. Environmental Pollution 213, 710-716

IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp, doi:10.1017/CBO9781107415324.

Jackson RB, Down A, Phillips NG, Ackley RC, Cook CW, Plata DL, Zhao K (2014) Natural gas pipeline leaks across Washington, DC, Environmental science & technology 48 (3), 2051-2058

Keyes T, Ridge G, Klein M, Phillips N, Ackley R, Yang Y (2020) An enhanced procedure for urban mobile methane leak detection Heliyon 6 (10), e04876

Magavi Z (2018) Identifying and Rank-Ordering Large Volume Leaks in the Underground Natural Gas Distribution System of Massachusetts. Masters Thesis, Harvard University. https://dash.harvard.edu/handle/1/37945149

Magavi Z, Schulman A, Ackley B, Salgado E, Hendrick M, Phillips NG (2019) Identification of Large Volume Leaks in Natural Gas Distribution Systems AGU Fall Meeting Abstracts 2019, GC51M-0970

Olewuezi NP, Onoghojobi B, Udeoyibo CV (2015) A comparative study of different outlier detection methods in linear regression. Far East Journal of Theoretical Statistics 50:171-179.

Phillips NG, Ackley R, Crosson ER, Down A, Hutyra LR, Brondfield M, Karr JD, Zhao K, Jackson RB (2013) Mapping urban pipeline leaks: Methane leaks across Boston. Environmental pollution 173, 1-4

Schollaert C, Ackley RC, DeSantis A, Polka E, Scammell MK (2020) Natural gas leaks and tree death: A first-look case-control study of urban trees in Chelsea, MA USA. Environmental Pollution 263, Part A, 114464.

Von Fischer JC, Cooley D, Chamberlain S, Gaylord A, Griebenow CJ, Hamburg SP, Salo J, Schumacher R, Theobald D, Ham J (2017) Rapid, Vehicle-Based Identification of Location and Magnitude of Urban Natural Gas Pipeline Leaks. Environmental Science & Technology. 51:4091-4099. DOI: 10.1021/acs.est.6b06095

West JJ, Fiore AM, Horowitz LW, Mauzerall DL (2006) Global health benefits of mitigating ozone pollution with methane emission controls. PNAS. 103, 3988-3993.

ATTACHMENT A

WARD	GPS_ABS_	GPS_ABS_	origCH4
1	38.92575	-77.0297	5th Quintile
1	38.92207	-77.0413	5th Quintile
1	38.93072	-77.0296	5th Quintile
1	38.9141	-77.0317	5th Quintile
1	38.93202	-77.0241	5th Quintile
1	38.92484	-77.0392	5th Quintile
1	38.91793	-77.0239	5th Quintile
1	38.9352	-77.0309	5th Quintile
1	38.93236	-77.0268	5th Quintile
1	38.9328	-77.0352	5th Quintile
1	38.91669	-77.0219	5th Quintile
1	38.92429	-77.0256	5th Quintile
1	38.93358	-77.024	5th Quintile
1	38.91783	-77.047	5th Quintile
1	38.93102	-77.024	5th Quintile
1	38.92921	-77.0195	5th Quintile
1	38.93178	-77.0267	5th Quintile
1	38.93459	-77.0325	5th Quintile
1	38.92353	-77.0415	5th Quintile
1	38.92561	-77.0381	5th Quintile
1	38.93109	-77.0236	5th Quintile
1	38.92154	-77.046	5th Quintile
1	38.92458	-77.0256	5th Quintile
1	38.92764	-77.0369	5th Quintile
1	38.92475	-77.027	5th Quintile
1	38.93359	-77.0244	5th Quintile
1	38.9345	-77.0309	5th Quintile
1	38.93499	-77.0436	5th Quintile
1	38.93326	-77.0364	5th Quintile
1	38.9307	-77.029	5th Quintile
1	38.92157	-77.048	5th Quintile
1	38.92139	-77.0483	5th Quintile
1	38.93236	-77.0297	5th Quintile
1	38.93193	-77.0194	5th Quintile
1	38.93138	-77.0201	5th Quintile
1	38.9335	-77.0298	5th Quintile
1	38.92612	-77.0232	5th Quintile
1	38.9141	-77.0231	5th Quintile
1	38.92698	-77.0356	5th Quintile
1	38.91911	-77.0239	5th Quintile
1	38.93094	-77.0249	4th Quintile
1	38.92524	-77.0379	4th Quintile
1	38.93532	-77.0234	4th Quintile
1	38.92308	-77.0415	4th Quintile
1	38.92753	-77.0273	4th Quintile
1	38.91814	-77.0459	4th Quintile

Ward	Total Leaks
1	218
2	288
3	595
4	691
5	523
6	554
7	309
8	160

1	38.93191	-77.0237	4th Quintile
1	38.92477	-77.0292	4th Quintile
1	38.91784	-77.0442	4th Quintile
1	38.92576	-77.0311	4th Quintile
1	38.93595	-77.0315	4th Quintile
1	38.92575	-77.0286	4th Quintile
1	38.92676	-77.0295	4th Quintile
1	38.92582	-77.0264	4th Quintile
1	38.92416	-77.0226	4th Quintile
1	38.9324	-77.0405	4th Quintile
1	38.92247	-77.0413	4th Quintile
1	38.93068	-77.0228	4th Quintile
1	38.93176	-77.0284	4th Quintile
1	38.93064	-77.0234	4th Quintile
1	38.92786	-77.0373	4th Quintile
1	38.91411	-77.0234	4th Quintile
1	38.93325	-77.0388	4th Quintile
1	38.93331	-77.0427	4th Quintile
1	38.9141	-77.0225	4th Quintile
1	38.92577	-77.0277	4th Quintile
1	38.92379	-77.041	4th Quintile
1	38.91965	-77.0443	4th Quintile
1	38.93294	-77.0249	4th Quintile
1	38.92315	-77.0398	4th Quintile
1	38.92288	-77.0366	4th Quintile
1	38.92322	-77.0433	4th Quintile
1	38.93418	-77.0425	4th Quintile
1	38.92638	-77.0365	4th Quintile
1	38.92719	-77.0368	3rd Quintile
1	38.92758	-77.0235	3rd Quintile
1	38.93071	-77.0277	3rd Quintile
1	38.93657	-77.0309	3rd Quintile
1	38.93289	-77.0254	3rd Quintile
1	38.92578	-77.027	3rd Quintile
1	38.91983	-77.0319	3rd Quintile
1	38.92058	-77.0469	3rd Quintile
1	38.91411	-77.0291	3rd Quintile
1	38.92522	-77.0388	3rd Quintile
1	38.92477	-77.0306	3rd Quintile
1	38.9141	-77.0248	3rd Quintile
1	38.91783	-77.0439	3rd Quintile
1	38.9141	-77.0283	3rd Quintile
1	38.92485	-77.0261	3rd Quintile
1	38.92082	-77.024	3rd Quintile
1	38.91598	-77.026	3rd Quintile
1	38.93246	-77.0401	3rd Quintile
1	38.93527	-77.0238	3rd Quintile

1	38.92074	-77.0482	3rd Quintile
1	38.92167	-77.0253	3rd Quintile
1	38.92377	-77.0297	3rd Quintile
1	38.92062	-77.0319	3rd Quintile
1	38.93195	-77.0246	3rd Quintile
1	38.93458	-77.0316	3rd Quintile
1	38.92477	-77.0309	3rd Quintile
1	38.92163	-77.0413	3rd Quintile
1	38.92957	-77.0297	3rd Quintile
1	38.92856	-77.0297	3rd Quintile
1	38.93031	-77.0297	3rd Quintile
1	38.93626	-77.0297	3rd Quintile
1	38.91641	-77.0436	3rd Quintile
1	38.92233	-77.0451	3rd Quintile
1	38.92622	-77.0297	3rd Quintile
1	38.92576	-77.0293	3rd Quintile
1	38.92745	-77.0297	3rd Quintile
1	38.93275	-77.0388	3rd Quintile
1	38.93212	-77.0334	3rd Quintile
1	38.92209	-77.0253	3rd Quintile
1	38.93258	-77.0346	3rd Quintile
1	38.92971	-77.0413	3rd Quintile
1	38.9241	-77.0406	3rd Quintile
1	38.93597	-77.0212	3rd Quintile
1	38.91806	-77.0463	3rd Quintile
1	38.91875	-77.0246	3rd Quintile
1	38.92506	-77.0297	3rd Quintile
1	38.92789	-77.0377	2nd Quintile
1	38.92802	-77.041	2nd Quintile
1	38.91432	-77.0165	2nd Quintile
1	38.92333	-77.0418	2nd Quintile
1	38.93422	-77.0241	2nd Quintile
1	38.92632	-77.0357	2nd Quintile
1	38.93457	-77.0375	2nd Quintile
1	38.93133	-77.0214	2nd Quintile
1	38.91649	-77.0423	2nd Quintile
1	38.93458	-77.0302	2nd Quintile
1	38.92837	-77.0372	2nd Quintile
1	38.91719	-77.0159	2nd Quintile
1	38.92038	-77.0441	2nd Quintile
1	38.93465	-77.0226	2nd Quintile
1	38.92705	-77.0271	2nd Quintile
1	38.91716	-77.0219	2nd Quintile
1	38.93611	-77.0321	2nd Quintile
1	38.93371	-77.0364	2nd Quintile
1	38.93531	-77.0312	2nd Quintile
1	38.93644	-77.0205	2nd Quintile

1	38.93239	-77.0341	2nd Quintile
1	38.9186	-77.0239	2nd Quintile
1	38.92316	-77.0473	2nd Quintile
1	38.9315	-77.0267	2nd Quintile
1	38.91665	-77.042	2nd Quintile
1	38.92058	-77.0326	2nd Quintile
1	38.91692	-77.0463	2nd Quintile
1	38.92678	-77.0266	2nd Quintile
1	38.9141	-77.0307	2nd Quintile
1	38.93388	-77.0239	2nd Quintile
1	38.93419	-77.042	2nd Quintile
1	38.92767	-77.0291	2nd Quintile
1	38.92313	-77.0403	2nd Quintile
1	38.93109	-77.0212	2nd Quintile
1	38.92925	-77.039	2nd Quintile
1	38.92991	-77.0297	2nd Quintile
1	38.93206	-77.0386	2nd Quintile
1	38.93334	-77.0413	2nd Quintile
1	38.92087	-77.0235	2nd Quintile
1	38.92823	-77.023	2nd Quintile
1	38.93477	-77.021	2nd Quintile
1	38.92664	-77.027	2nd Quintile
1	38.9356	-77.0213	2nd Quintile
1	38.93438	-77.0363	2nd Quintile
1	38.928	-77.0243	2nd Quintile
1	38.92629	-77.027	2nd Quintile
1	38.92481	-77.0265	2nd Quintile
1	38.92432	-77.0391	2nd Quintile
1	38.91643	-77.027	2nd Quintile
1	38.93206	-77.0267	2nd Quintile
1	38.93148	-77.0453	2nd Quintile
1	38.93072	-77.0222	2nd Quintile
1	38.92695	-77.0212	1st Quintile
1	38.93034	-77.0198	1st Quintile
1	38.91783	-77.0429	1st Quintile
1	38.92768	-77.0287	1st Quintile
1	38.9235	-77.0437	1st Quintile
1	38.92774	-77.0297	1st Quintile
1	38.93275	-77.0454	1st Quintile
1	38.9141	-77.0311	1st Quintile
1	38.92973	-77.0433	1st Quintile
1	38.91592	-77.0145	1st Quintile
1	38.92309	-77.0412	1st Quintile
1	38.93069	-77.0371	1st Quintile
1	38.91558	-77.0301	1st Quintile
1	38.91917	-77.0447	1st Quintile
1	38.92902	-77.0228	1st Quintile

1	38.91863	-77.0446	1st Quintile
1	38.92641	-77.0255	1st Quintile
1	38.93347	-77.0259	1st Quintile
1	38.93617	-77.0221	1st Quintile
1	38.93415	-77.0272	1st Quintile
1	38.93122	-77.044	1st Quintile
1	38.92538	-77.027	1st Quintile
1	38.93391	-77.0231	1st Quintile
1	38.93565	-77.0309	1st Quintile
1	38.93131	-77.0198	1st Quintile
1	38.9346	-77.0369	1st Quintile
1	38.93255	-77.0237	1st Quintile
1	38.92259	-77.0271	1st Quintile
1	38.92064	-77.0401	1st Quintile
1	38.92392	-77.0256	1st Quintile
1	38.91783	-77.0423	1st Quintile
1	38.93531	-77.0326	1st Quintile
1	38.93003	-77.0217	1st Quintile
1	38.9346	-77.0221	1st Quintile
1	38.93097	-77.0383	1st Quintile
1	38.91833	-77.0239	1st Quintile
1	38.92235	-77.0459	1st Quintile
1	38.93695	-77.0218	1st Quintile
1	38.92	-77.0322	1st Quintile
1	38.9339	-77.0309	1st Quintile
1	38.93295	-77.0277	1st Quintile
1	38.93202	-77.0309	1st Quintile
1	38.93458	-77.0296	1st Quintile
1	38.93324	-77.0275	1st Quintile
1	38.91811	-77.0354	1st Quintile
1	38.91715	-77.0366	1st Quintile
2	38.90575	-77.026	5th Quintile
2	38.90685	-77.0597	5th Quintile
2	38.90926	-77.0582	5th Quintile
2	38.91539	-77.0729	5th Quintile
2	38.91262	-77.0287	5th Quintile
2	38.91034	-77.0416	5th Quintile
2	38.91356	-77.0735	5th Quintile
2	38.91456	-77.0693	5th Quintile
2	38.90781	-77.026	5th Quintile
2	38.91484	-77.0415	5th Quintile
2	38.91453	-77.045	5th Quintile
2	38.90565	-77.027	5th Quintile
2	38.91227	-77.0582	5th Quintile
2	38.90651	-77.0661	5th Quintile
2	38.90276	-77.027	5th Quintile
2	38.90449	-77.0612	5th Quintile

2	38.90162	-77.0537	5th Quintile
2	38.91113	-77.0298	5th Quintile
2	38.91416	-77.0693	5th Quintile
2	38.91263	-77.0281	5th Quintile
2	38.91108	-77.0271	5th Quintile
2	38.91388	-77.0449	5th Quintile
2	38.90686	-77.0661	5th Quintile
2	38.91628	-77.0508	5th Quintile
2	38.90812	-77.026	5th Quintile
2	38.91038	-77.0341	5th Quintile
2	38.91558	-77.0386	5th Quintile
2	38.91187	-77.0365	5th Quintile
2	38.90965	-77.026	5th Quintile
2	38.91484	-77.0361	5th Quintile
2	38.91113	-77.0362	5th Quintile
2	38.91262	-77.0276	5th Quintile
2	38.91194	-77.0593	5th Quintile
2	38.9104	-77.0331	5th Quintile
2	38.91263	-77.0297	5th Quintile
2	38.90981	-77.0309	5th Quintile
2	38.9136	-77.0727	5th Quintile
2	38.90633	-77.027	5th Quintile
2	38.91053	-77.0281	5th Quintile
2	38.91045	-77.0271	5th Quintile
2	38.90843	-77.0613	5th Quintile
2	38.91419	-77.0416	5th Quintile
2	38.91112	-77.028	5th Quintile
2	38.90686	-77.0581	5th Quintile
2	38.90699	-77.0592	5th Quintile
2	38.90107	-77.0515	4th Quintile
2	38.91882	-77.053	4th Quintile
2	38.91009	-77.0309	4th Quintile
2	38.91558	-77.0416	4th Quintile
2	38.91411	-77.0503	4th Quintile
2	38.90756	-77.0612	4th Quintile
2	38.91187	-77.0307	4th Quintile
2	38.90847	-77.0618	4th Quintile
2	38.9134	-77.0488	4th Quintile
2	38.9096	-77.0288	4th Quintile
2	38.90076	-77.0547	4th Quintile
2	38.90963	-77.0416	4th Quintile
2	38.91536	-77.0746	4th Quintile
2	38.90978	-77.0691	4th Quintile
2	38.91657	-77.0506	4th Quintile
2	38.90845	-77.063	4th Quintile
2	38.90054	-77.0514	4th Quintile
2	38.91335	-77.0502	4th Quintile

2	38.91047	-77.0582	4th Quintile
2	38.91334	-77.0507	4th Quintile
2	38.90928	-77.0633	4th Quintile
2	38.91407	-77.0435	4th Quintile
2	38.91167	-77.0679	4th Quintile
2	38.90941	-77.0305	4th Quintile
2	38.91562	-77.0506	4th Quintile
2	38.91636	-77.0417	4th Quintile
2	38.91096	-77.0593	4th Quintile
2	38.91039	-77.0323	4th Quintile
2	38.90639	-77.0295	4th Quintile
2	38.90205	-77.0504	4th Quintile
2	38.89972	-77.0533	4th Quintile
2	38.90595	-77.0677	4th Quintile
2	38.90934	-77.0572	4th Quintile
2	38.90934	-77.0599	4th Quintile
2	38.91263	-77.0311	4th Quintile
2	38.91483	-77.0357	4th Quintile
2	38.91832	-77.052	4th Quintile
2	38.9077	-77.0559	4th Quintile
2	38.91538	-77.0739	4th Quintile
2	38.90857	-77.026	4th Quintile
2	38.90737	-77.026	4th Quintile
2	38.91071	-77.0691	4th Quintile
2	38.90673	-77.027	4th Quintile
2	38.90427	-77.027	4th Quintile
2	38.9119	-77.0504	4th Quintile
2	38.91483	-77.0353	4th Quintile
2	38.90768	-77.0596	4th Quintile
2	38.90936	-77.0564	4th Quintile
2	38.90969	-77.0385	4th Quintile
2	38.90928	-77.0557	4th Quintile
2	38.90766	-77.0609	3rd Quintile
2	38.91114	-77.0293	3rd Quintile
2	38.90771	-77.0555	3rd Quintile
2	38.91853	-77.0532	3rd Quintile
2	38.91044	-77.0297	3rd Quintile
2	38.91409	-77.0405	3rd Quintile
2	38.91224	-77.0609	3rd Quintile
2	38.91628	-77.0518	3rd Quintile
2	38.9104	-77.0348	3rd Quintile
2	38.91411	-77.0413	3rd Quintile
2	38.90932	-77.0591	3rd Quintile
2	38.90894	-77.0613	3rd Quintile
2	38.91486	-77.0506	3rd Quintile
2	38.91411	-77.0429	3rd Quintile
2	38.91631	-77.0406	3rd Quintile

2	38.91411	-77.0334	3rd Quintile
2	38.91361	-77.0719	3rd Quintile
2	38.90742	-77.0592	3rd Quintile
2	38.91007	-77.0582	3rd Quintile
2	38.90964	-77.0448	3rd Quintile
2	38.91355	-77.074	3rd Quintile
2	38.90546	-77.0316	3rd Quintile
2	38.90905	-77.0592	3rd Quintile
2	38.90766	-77.06	3rd Quintile
2	38.91179	-77.0284	3rd Quintile
2	38.90614	-77.0661	3rd Quintile
2	38.91421	-77.0449	3rd Quintile
2	38.91698	-77.0411	3rd Quintile
2	38.90929	-77.0629	3rd Quintile
2	38.91106	-77.0416	3rd Quintile
2	38.9141	-77.0329	3rd Quintile
2	38.90073	-77.0488	3rd Quintile
2	38.90763	-77.0627	3rd Quintile
2	38.9102	-77.0294	3rd Quintile
2	38.91334	-77.0374	3rd Quintile
2	38.91336	-77.0497	3rd Quintile
2	38.91112	-77.0349	3rd Quintile
2	38.91599	-77.0702	3rd Quintile
2	38.91184	-77.0405	3rd Quintile
2	38.90624	-77.026	3rd Quintile
2	38.91282	-77.0609	3rd Quintile
2	38.90674	-77.0695	3rd Quintile
2	38.91129	-77.0582	3rd Quintile
2	38.90828	-77.0571	3rd Quintile
2	38.90202	-77.0499	3rd Quintile
2	38.91335	-77.0384	3rd Quintile
2	38.90787	-77.0571	3rd Quintile
2	38.91338	-77.0419	3rd Quintile
2	38.90764	-77.0617	3rd Quintile
2	38.9105	-77.0592	3rd Quintile
2	38.90887	-77.0691	3rd Quintile
2	38.91265	-77.0692	3rd Quintile
2	38.91336	-77.0476	3rd Quintile
2	38.90794	-77.0488	3rd Quintile
2	38.90685	-77.0602	3rd Quintile
2	38.91257	-77.0581	3rd Quintile
2	38.91092	-77.0365	3rd Quintile
2	38.90685	-77.0606	3rd Quintile
2	38.91372	-77.0672	3rd Quintile
2	38.91484	-77.0408	3rd Quintile
2	38.90676	-77.0689	3rd Quintile
2	38.91411	-77.0358	2nd Quintile

2	38.9113	-77.0598	2nd Quintile
2	38.90568	-77.0298	2nd Quintile
2	38.91374	-77.0693	2nd Quintile
2	38.90976	-77.0304	2nd Quintile
2	38.91319	-77.0449	2nd Quintile
2	38.91262	-77.0494	2nd Quintile
2	38.91447	-77.0729	2nd Quintile
2	38.91144	-77.0296	2nd Quintile
2	38.91114	-77.0315	2nd Quintile
2	38.91545	-77.0713	2nd Quintile
2	38.90966	-77.0282	2nd Quintile
2	38.90851	-77.027	2nd Quintile
2	38.9091	-77.0417	2nd Quintile
2	38.91181	-77.0609	2nd Quintile
2	38.91111	-77.0289	2nd Quintile
2	38.9163	-77.0387	2nd Quintile
2	38.90516	-77.0656	2nd Quintile
2	38.91111	-77.0422	2nd Quintile
2	38.91448	-77.0733	2nd Quintile
2	38.91256	-77.0588	2nd Quintile
2	38.91251	-77.0593	2nd Quintile
2	38.91771	-77.0474	2nd Quintile
2	38.90865	-77.0364	2nd Quintile
2	38.91232	-77.0374	2nd Quintile
2	38.90817	-77.027	2nd Quintile
2	38.91463	-77.039	2nd Quintile
2	38.90527	-77.0652	2nd Quintile
2	38.9133	-77.063	2nd Quintile
2	38.91258	-77.0596	2nd Quintile
2	38.91275	-77.0727	2nd Quintile
2	38.9164	-77.0702	2nd Quintile
2	38.91655	-77.0685	2nd Quintile
2	38.90812	-77.0558	2nd Quintile
2	38.9098	-77.0582	2nd Quintile
2	38.91752	-77.048	2nd Quintile
2	38.90868	-77.0296	2nd Quintile
2	38.91538	-77.0735	2nd Quintile
2	38.91115	-77.0409	2nd Quintile
2	38.90854	-77.0565	2nd Quintile
2	38.91338	-77.0422	2nd Quintile
2	38.90988	-77.0592	2nd Quintile
2	38.91572	-77.0743	2nd Quintile
2	38.90847	-77.0606	2nd Quintile
2	38.90939	-77.0561	2nd Quintile
2	38.90788	-77.0581	2nd Quintile
2	38.91286	-77.0434	2nd Quintile
2	38.91158	-77.0593	1st Quintile

2	38.90965	-77.0323	1st Quintile
2	38.9075	-77.0363	1st Quintile
2	38.91267	-77.0601	1st Quintile
2	38.91569	-77.0434	1st Quintile
2	38.91015	-77.03	1st Quintile
2	38.91631	-77.0366	1st Quintile
2	38.91703	-77.0526	1st Quintile
2	38.90858	-77.0465	1st Quintile
2	38.90594	-77.0703	1st Quintile
2	38.90974	-77.0679	1st Quintile
2	38.90585	-77.0661	1st Quintile
2	38.9104	-77.0327	1st Quintile
2	38.90845	-77.0625	1st Quintile
2	38.90818	-77.0364	1st Quintile
2	38.91507	-77.0712	1st Quintile
2	38.90549	-77.0661	1st Quintile
2	38.90963	-77.0271	1st Quintile
2	38.9141	-77.0442	1st Quintile
2	38.91041	-77.0276	1st Quintile
2	38.9138	-77.0668	1st Quintile
2	38.91558	-77.0425	1st Quintile
2	38.9141	-77.0491	1st Quintile
2	38.90217	-77.0496	1st Quintile
2	38.91546	-77.0442	1st Quintile
2	38.9079	-77.0473	1st Quintile
2	38.90714	-77.0581	1st Quintile
2	38.91822	-77.0492	1st Quintile
2	38.91051	-77.0604	1st Quintile
2	38.91114	-77.0386	1st Quintile
2	38.91558	-77.0526	1st Quintile
2	38.90977	-77.067	1st Quintile
2	38.91547	-77.0703	1st Quintile
2	38.91057	-77.0558	1st Quintile
2	38.91698	-77.0393	1st Quintile
2	38.91339	-77.038	1st Quintile
2	38.91484	-77.0401	1st Quintile
2	38.90685	-77.0558	1st Quintile
2	38.91114	-77.0355	1st Quintile
2	38.91369	-77.0687	1st Quintile
2	38.91072	-77.0417	1st Quintile
2	38.90683	-77.0654	1st Quintile
2	38.91071	-77.0687	1st Quintile
2	38.91115	-77.04	1st Quintile
2	38.91486	-77.0515	1st Quintile
2	38.9093	-77.0604	1st Quintile
2	38.91336	-77.0432	1st Quintile
2	38.91343	-77.0635	1st Quintile

2	38.91291	-77.0614	1st Quintile
2	38.9114	-77.0367	1st Quintile
2	38.90685	-77.0586	1st Quintile
2	38.90803	-77.0613	1st Quintile
2	38.91054	-77.0578	1st Quintile
2	38.91488	-77.0349	1st Quintile
2	38.91038	-77.0619	1st Quintile
2	38.90508	-77.0701	1st Quintile
2	38.91019	-77.028	1st Quintile
2	38.91514	-77.0385	1st Quintile
2	38.90848	-77.0558	1st Quintile
2	38.91305	-77.0621	1st Quintile
2	38.90992	-77.0448	1st Quintile
2	38.91412	-77.0515	1st Quintile
2	38.91328	-77.0521	1st Quintile
2	38.90676	-77.045	1st Quintile
2	38.90749	-77.0369	1st Quintile
2	38.91026	-77.0452	1st Quintile
2	38.90936	-77.0466	1st Quintile
2	38.91039	-77.0336	1st Quintile
2	38.90733	-77.0295	1st Quintile
2	38.91333	-77.0367	1st Quintile
2	38.90379	-77.0268	1st Quintile
2	38.9092	-77.0423	1st Quintile
2	38.90725	-77.0482	1st Quintile
2	38.91172	-77.0296	1st Quintile
2	38.90968	-77.0314	1st Quintile
2	38.90772	-77.0242	1st Quintile
2	38.90566	-77.0303	1st Quintile
2	38.91113	-77.0439	1st Quintile
2	38.91188	-77.0311	1st Quintile
2	38.91411	-77.034	1st Quintile
2	38.91188	-77.0321	1st Quintile
2	38.9126	-77.0365	1st Quintile
2	38.90968	-77.0318	1st Quintile
2	38.90302	-77.0296	1st Quintile
2	38.90719	-77.0361	1st Quintile
3	38.95692	-77.071	5th Quintile
3	38.91688	-77.0729	5th Quintile
3	38.93989	-77.102	5th Quintile
3	38.9595	-77.0725	5th Quintile
3	38.94555	-77.076	5th Quintile
3	38.9471	-77.0725	5th Quintile
3	38.93256	-77.0678	5th Quintile
3	38.94322	-77.0664	5th Quintile
3	38.94793	-77.0616	5th Quintile
3	38.91654	-77.0729	5th Quintile

3	38.93026	-77.1003	5th Quintile
3	38.93243	-77.0856	5th Quintile
3	38.94265	-77.0627	5th Quintile
3	38.95903	-77.0747	5th Quintile
3	38.94145	-77.0886	5th Quintile
3	38.92886	-77.0926	5th Quintile
3	38.9187	-77.0584	5th Quintile
3	38.95075	-77.0583	5th Quintile
3	38.93261	-77.0687	5th Quintile
3	38.96493	-77.0753	5th Quintile
3	38.92611	-77.0698	5th Quintile
3	38.93739	-77.0665	5th Quintile
3	38.96982	-77.0702	5th Quintile
3	38.9471	-77.071	5th Quintile
3	38.93029	-77.0884	5th Quintile
3	38.9247	-77.0682	5th Quintile
3	38.92685	-77.0686	5th Quintile
3	38.94822	-77.058	5th Quintile
3	38.92743	-77.077	5th Quintile
3	38.94628	-77.0746	5th Quintile
3	38.94966	-77.0573	5th Quintile
3	38.9658	-77.0758	5th Quintile
3	38.94791	-77.0669	5th Quintile
3	38.96402	-77.0726	5th Quintile
3	38.9448	-77.0776	5th Quintile
3	38.92725	-77.0524	5th Quintile
3	38.92893	-77.0917	5th Quintile
3	38.94063	-77.0968	5th Quintile
3	38.95075	-77.0648	5th Quintile
3	38.93654	-77.1035	5th Quintile
3	38.95593	-77.0772	5th Quintile
3	38.94631	-77.0722	5th Quintile
3	38.95158	-77.0926	5th Quintile
3	38.93869	-77.0932	5th Quintile
3	38.92091	-77.0738	5th Quintile
3	38.93542	-77.0985	5th Quintile
3	38.95585	-77.0663	5th Quintile
3	38.92639	-77.0577	5th Quintile
3	38.95143	-77.0742	5th Quintile
3	38.96232	-77.074	5th Quintile
3	38.96033	-77.0771	5th Quintile
3	38.93853	-77.0664	5th Quintile
3	38.93039	-77.073	5th Quintile
3	38.9432	-77.0691	5th Quintile
3	38.94677	-77.0722	5th Quintile
3	38.94619	-77.0791	5th Quintile
3	38.93135	-77.0886	5th Quintile

3	38.9554	-77.0771	5th Quintile
3	38.92889	-77.0922	5th Quintile
3	38.94457	-77.077	5th Quintile
3	38.93666	-77.0986	5th Quintile
3	38.93418	-77.095	5th Quintile
3	38.94232	-77.0625	5th Quintile
3	38.95469	-77.0818	5th Quintile
3	38.96088	-77.0733	5th Quintile
3	38.92797	-77.0986	5th Quintile
3	38.92363	-77.072	5th Quintile
3	38.94476	-77.0968	5th Quintile
3	38.95338	-77.0926	5th Quintile
3	38.92323	-77.0603	5th Quintile
3	38.9388	-77.0709	5th Quintile
3	38.95187	-77.0616	5th Quintile
3	38.95208	-77.0679	5th Quintile
3	38.92754	-77.0766	5th Quintile
3	38.95595	-77.0902	5th Quintile
3	38.94312	-77.063	5th Quintile
3	38.95854	-77.0701	5th Quintile
3	38.929	-77.0912	5th Quintile
3	38.96762	-77.0722	5th Quintile
3	38.92222	-77.0992	5th Quintile
3	38.93814	-77.0627	5th Quintile
3	38.95471	-77.0808	5th Quintile
3	38.91962	-77.0585	5th Quintile
3	38.95075	-77.0592	5th Quintile
3	38.94289	-77.0928	5th Quintile
3	38.95597	-77.0797	5th Quintile
3	38.94041	-77.0873	5th Quintile
3	38.94325	-77.0933	5th Quintile
3	38.96401	-77.074	5th Quintile
3	38.93243	-77.0861	5th Quintile
3	38.9497	-77.0582	5th Quintile
3	38.93351	-77.0571	5th Quintile
3	38.90965	-77.0814	5th Quintile
3	38.95903	-77.0686	5th Quintile
3	38.93137	-77.085	5th Quintile
3	38.94966	-77.0753	5th Quintile
3	38.93351	-77.0796	5th Quintile
3	38.91917	-77.0787	5th Quintile
3	38.94399	-77.0748	5th Quintile
3	38.93781	-77.099	5th Quintile
3	38.93464	-77.0662	5th Quintile
3	38.96401	-77.0745	5th Quintile
3	38.92799	-77.0536	5th Quintile
3	38.94058	-77.0677	5th Quintile

3	38.93302	-77.0862	5th Quintile
3	38.94366	-77.0746	5th Quintile
3	38.9471	-77.0731	5th Quintile
3	38.93937	-77.0969	5th Quintile
3	38.96405	-77.075	5th Quintile
3	38.95653	-77.0835	5th Quintile
3	38.92602	-77.0517	5th Quintile
3	38.95319	-77.0688	5th Quintile
3	38.95308	-77.0926	4th Quintile
3	38.94855	-77.0558	4th Quintile
3	38.92938	-77.058	4th Quintile
3	38.91984	-77.0567	4th Quintile
3	38.94859	-77.0581	4th Quintile
3	38.96864	-77.072	4th Quintile
3	38.94479	-77.0767	4th Quintile
3	38.95828	-77.0703	4th Quintile
3	38.92922	-77.106	4th Quintile
3	38.94971	-77.0905	4th Quintile
3	38.95904	-77.077	4th Quintile
3	38.96666	-77.0781	4th Quintile
3	38.93345	-77.0709	4th Quintile
3	38.93554	-77.0675	4th Quintile
3	38.96401	-77.0698	4th Quintile
3	38.95663	-77.0708	4th Quintile
3	38.94226	-77.069	4th Quintile
3	38.92456	-77.0782	4th Quintile
3	38.93036	-77.0574	4th Quintile
3	38.91915	-77.0579	4th Quintile
3	38.94581	-77.0712	4th Quintile
3	38.96311	-77.0677	4th Quintile
3	38.92618	-77.0774	4th Quintile
3	38.93098	-77.091	4th Quintile
3	38.95066	-77.0578	4th Quintile
3	38.94879	-77.0671	4th Quintile
3	38.93406	-77.1033	4th Quintile
3	38.95969	-77.0773	4th Quintile
3	38.92753	-77.0849	4th Quintile
3	38.93776	-77.0664	4th Quintile
3	38.92692	-77.0782	4th Quintile
3	38.9649	-77.0803	4th Quintile
3	38.92612	-77.0731	4th Quintile
3	38.93597	-77.099	4th Quintile
3	38.944	-77.0734	4th Quintile
3	38.9185	-77.072	4th Quintile
3	38.96875	-77.0728	4th Quintile
3	38.93851	-77.0712	4th Quintile
3	38.94319	-77.083	4th Quintile

3	38.95372	-77.0838	4th Quintile
3	38.94028	-77.1012	4th Quintile
3	38.91732	-77.0729	4th Quintile
3	38.92476	-77.051	4th Quintile
3	38.92886	-77.0845	4th Quintile
3	38.95175	-77.0596	4th Quintile
3	38.91779	-77.072	4th Quintile
3	38.94629	-77.0727	4th Quintile
3	38.95469	-77.0804	4th Quintile
3	38.9261	-77.0568	4th Quintile
3	38.94971	-77.0815	4th Quintile
3	38.95903	-77.0761	4th Quintile
3	38.92285	-77.0603	4th Quintile
3	38.94479	-77.08	4th Quintile
3	38.94551	-77.0746	4th Quintile
3	38.9631	-77.0699	4th Quintile
3	38.93479	-77.0675	4th Quintile
3	38.94479	-77.0759	4th Quintile
3	38.93295	-77.0664	4th Quintile
3	38.9319	-77.0743	4th Quintile
3	38.95896	-77.0722	4th Quintile
3	38.94915	-77.0548	4th Quintile
3	38.95761	-77.0771	4th Quintile
3	38.94117	-77.0868	4th Quintile
3	38.94882	-77.0757	4th Quintile
3	38.9551	-77.0658	4th Quintile
3	38.94313	-77.0659	4th Quintile
3	38.95399	-77.0695	4th Quintile
3	38.95827	-77.0718	4th Quintile
3	38.91919	-77.0772	4th Quintile
3	38.93349	-77.0686	4th Quintile
3	38.94397	-77.0854	4th Quintile
3	38.95639	-77.0718	4th Quintile
3	38.92807	-77.1047	4th Quintile
3	38.95105	-77.0943	4th Quintile
3	38.95971	-77.0747	4th Quintile
3	38.9292	-77.0862	4th Quintile
3	38.95903	-77.0699	4th Quintile
3	38.95331	-77.0648	4th Quintile
3	38.9237	-77.0709	4th Quintile
3	38.95805	-77.0842	4th Quintile
3	38.91987	-77.0589	4th Quintile
3	38.93242	-77.0878	4th Quintile
3	38.95596	-77.0814	4th Quintile
3	38.93153	-77.0985	4th Quintile
3	38.91654	-77.0707	4th Quintile
3	38.93746	-77.072	4th Quintile

3	38.95406	-77.0803	4th Quintile
3	38.92125	-77.0986	4th Quintile
3	38.95187	-77.0642	4th Quintile
3	38.95332	-77.0945	4th Quintile
3	38.93275	-77.0935	4th Quintile
3	38.91926	-77.073	4th Quintile
3	38.9597	-77.0685	4th Quintile
3	38.92768	-77.0527	4th Quintile
3	38.95473	-77.0926	4th Quintile
3	38.95466	-77.0793	4th Quintile
3	38.95105	-77.0871	4th Quintile
3	38.95185	-77.062	4th Quintile
3	38.95469	-77.0712	4th Quintile
3	38.93817	-77.0711	4th Quintile
3	38.95468	-77.0752	4th Quintile
3	38.95212	-77.0715	4th Quintile
3	38.95842	-77.0771	4th Quintile
3	38.92237	-77.0746	4th Quintile
3	38.92509	-77.0684	4th Quintile
3	38.96763	-77.0764	4th Quintile
3	38.95142	-77.0729	4th Quintile
3	38.92618	-77.077	4th Quintile
3	38.92185	-77.0991	4th Quintile
3	38.9291	-77.0633	4th Quintile
3	38.95986	-77.0727	4th Quintile
3	38.96763	-77.073	4th Quintile
3	38.93633	-77.0663	4th Quintile
3	38.95155	-77.0616	4th Quintile
3	38.93466	-77.0717	4th Quintile
3	38.93514	-77.0675	4th Quintile
3	38.95969	-77.0716	4th Quintile
3	38.93419	-77.0664	4th Quintile
3	38.95206	-77.0602	4th Quintile
3	38.93377	-77.0928	4th Quintile
3	38.92544	-77.0731	4th Quintile
3	38.95276	-77.0887	4th Quintile
3	38.9497	-77.0691	4th Quintile
3	38.92507	-77.0948	3rd Quintile
3	38.95071	-77.0672	3rd Quintile
3	38.93464	-77.0685	3rd Quintile
3	38.94792	-77.0909	3rd Quintile
3	38.9631	-77.073	3rd Quintile
3	38.93841	-77.0621	3rd Quintile
3	38.94563	-77.0643	3rd Quintile
3	38.94233	-77.0746	3rd Quintile
3	38.95596	-77.081	3rd Quintile
3	38.94983	-77.0669	3rd Quintile

3	38.93164	-77.0769	3rd Quintile
3	38.93349	-77.0666	3rd Quintile
3	38.96012	-77.0659	3rd Quintile
3	38.93253	-77.0662	3rd Quintile
3	38.9667	-77.0748	3rd Quintile
3	38.96705	-77.0732	3rd Quintile
3	38.95468	-77.0757	3rd Quintile
3	38.95792	-77.0771	3rd Quintile
3	38.96377	-77.0675	3rd Quintile
3	38.92362	-77.0728	3rd Quintile
3	38.95838	-77.0747	3rd Quintile
3	38.95186	-77.0611	3rd Quintile
3	38.93436	-77.0955	3rd Quintile
3	38.9262	-77.0709	3rd Quintile
3	38.95331	-77.0622	3rd Quintile
3	38.95905	-77.0817	3rd Quintile
3	38.92763	-77.1042	3rd Quintile
3	38.96384	-77.0701	3rd Quintile
3	38.9311	-77.0572	3rd Quintile
3	38.92618	-77.0764	3rd Quintile
3	38.9262	-77.0739	3rd Quintile
3	38.92315	-77.0709	3rd Quintile
3	38.93099	-77.0728	3rd Quintile
3	38.94365	-77.0938	3rd Quintile
3	38.92013	-77.0592	3rd Quintile
3	38.95627	-77.0757	3rd Quintile
3	38.9479	-77.0625	3rd Quintile
3	38.9268	-77.0984	3rd Quintile
3	38.93556	-77.0714	3rd Quintile
3	38.96539	-77.0798	3rd Quintile
3	38.94314	-77.065	3rd Quintile
3	38.95627	-77.0766	3rd Quintile
3	38.94479	-77.0707	3rd Quintile
3	38.94638	-77.0698	3rd Quintile
3	38.96617	-77.0781	3rd Quintile
3	38.93325	-77.0942	3rd Quintile
3	38.93144	-77.057	3rd Quintile
3	38.94207	-77.061	3rd Quintile
3	38.95041	-77.0576	3rd Quintile
3	38.93834	-77.0975	3rd Quintile
3	38.9497	-77.0847	3rd Quintile
3	38.92885	-77.1056	3rd Quintile
3	38.96976	-77.0722	3rd Quintile
3	38.92864	-77.0632	3rd Quintile
3	38.94554	-77.0739	3rd Quintile
3	38.96058	-77.0665	3rd Quintile
3	38.91911	-77.0708	3rd Quintile

3	38.93026	-77.1022	3rd Quintile
3	38.96672	-77.0742	3rd Quintile
3	38.94691	-77.067	3rd Quintile
3	38.9645	-77.0772	3rd Quintile
3	38.92121	-77.0541	3rd Quintile
3	38.92471	-77.0697	3rd Quintile
3	38.92139	-77.0571	3rd Quintile
3	38.9192	-77.0796	3rd Quintile
3	38.92648	-77.1046	3rd Quintile
3	38.93354	-77.0935	3rd Quintile
3	38.94089	-77.0878	3rd Quintile
3	38.93819	-77.0665	3rd Quintile
3	38.9202	-77.0557	3rd Quintile
3	38.96609	-77.0764	3rd Quintile
3	38.93692	-77.0975	3rd Quintile
3	38.9389	-77.092	3rd Quintile
3	38.95469	-77.0826	3rd Quintile
3	38.95627	-77.0752	3rd Quintile
3	38.93452	-77.0964	3rd Quintile
3	38.94479	-77.0713	3rd Quintile
3	38.94629	-77.0734	3rd Quintile
3	38.95836	-77.0794	3rd Quintile
3	38.91846	-77.0587	3rd Quintile
3	38.95214	-77.0616	3rd Quintile
3	38.92678	-77.0847	3rd Quintile
3	38.94416	-77.0926	3rd Quintile
3	38.95702	-77.0887	3rd Quintile
3	38.9325	-77.0934	3rd Quintile
3	38.92369	-77.0614	3rd Quintile
3	38.96689	-77.0768	3rd Quintile
3	38.94338	-77.0746	3rd Quintile
3	38.95972	-77.073	3rd Quintile
3	38.95315	-77.0803	3rd Quintile
3	38.9381	-77.0686	3rd Quintile
3	38.94859	-77.0944	3rd Quintile
3	38.93987	-77.0866	3rd Quintile
3	38.92593	-77.0623	3rd Quintile
3	38.96209	-77.0727	3rd Quintile
3	38.96402	-77.0685	3rd Quintile
3	38.96404	-77.0716	3rd Quintile
3	38.94971	-77.0558	3rd Quintile
3	38.92668	-77.0576	3rd Quintile
3	38.92776	-77.0633	3rd Quintile
3	38.92608	-77.0664	3rd Quintile
3	38.93627	-77.0675	3rd Quintile
3	38.93524	-77.062	3rd Quintile
3	38.96401	-77.0787	3rd Quintile

3	38.94556	-77.0724	3rd Quintile
3	38.95125	-77.0616	3rd Quintile
3	38.92779	-77.0839	3rd Quintile
3	38.96663	-77.0688	3rd Quintile
3	38.93693	-77.0591	3rd Quintile
3	38.95627	-77.0803	3rd Quintile
3	38.92013	-77.0733	3rd Quintile
3	38.94637	-77.0944	3rd Quintile
3	38.95185	-77.0607	3rd Quintile
3	38.94702	-77.0652	3rd Quintile
3	38.96313	-77.0772	3rd Quintile
3	38.94641	-77.0719	3rd Quintile
3	38.96582	-77.0749	3rd Quintile
3	38.92879	-77.0575	3rd Quintile
3	38.95837	-77.0738	3rd Quintile
3	38.91868	-77.0717	3rd Quintile
3	38.95076	-77.0555	3rd Quintile
3	38.93216	-77.078	3rd Quintile
3	38.9125	-77.0815	3rd Quintile
3	38.95132	-77.0602	3rd Quintile
3	38.94631	-77.0817	3rd Quintile
3	38.95843	-77.0845	3rd Quintile
3	38.92681	-77.0758	3rd Quintile
3	38.95048	-77.0541	3rd Quintile
3	38.93557	-77.0727	3rd Quintile
3	38.91916	-77.0881	3rd Quintile
3	38.92867	-77.0849	3rd Quintile
3	38.95616	-77.072	2nd Quintile
3	38.95688	-77.0803	2nd Quintile
3	38.94519	-77.0558	2nd Quintile
3	38.94967	-77.0804	2nd Quintile
3	38.93138	-77.0856	2nd Quintile
3	38.93315	-77.074	2nd Quintile
3	38.92981	-77.0886	2nd Quintile
3	38.93336	-77.0862	2nd Quintile
3	38.95597	-77.0872	2nd Quintile
3	38.95626	-77.0748	2nd Quintile
3	38.92173	-77.0756	2nd Quintile
3	38.93351	-77.0772	2nd Quintile
3	38.9275	-77.0688	2nd Quintile
3	38.95805	-77.0812	2nd Quintile
3	38.95904	-77.0682	2nd Quintile
3	38.93704	-77.0724	2nd Quintile
3	38.96077	-77.0771	2nd Quintile
3	38.92817	-77.0842	2nd Quintile
3	38.94378	-77.0926	2nd Quintile
3	38.95109	-77.0604	2nd Quintile

3	38.94967	-77.0586	2nd Quintile
3	38.92077	-77.0747	2nd Quintile
3	38.92619	-77.0743	2nd Quintile
3	38.95345	-77.069	2nd Quintile
3	38.92807	-77.0633	2nd Quintile
3	38.96176	-77.0696	2nd Quintile
3	38.9634	-77.07	2nd Quintile
3	38.96209	-77.0758	2nd Quintile
3	38.95448	-77.0885	2nd Quintile
3	38.93332	-77.0946	2nd Quintile
3	38.95707	-77.0838	2nd Quintile
3	38.92667	-77.0636	2nd Quintile
3	38.95105	-77.0841	2nd Quintile
3	38.9265	-77.077	2nd Quintile
3	38.93288	-77.0771	2nd Quintile
3	38.92621	-77.0717	2nd Quintile
3	38.9335	-77.0777	2nd Quintile
3	38.9517	-77.06	2nd Quintile
3	38.92447	-77.0508	2nd Quintile
3	38.9631	-77.0738	2nd Quintile
3	38.954	-77.0715	2nd Quintile
3	38.93934	-77.0932	2nd Quintile
3	38.93585	-77.0675	2nd Quintile
3	38.94319	-77.0837	2nd Quintile
3	38.93188	-77.0886	2nd Quintile
3	38.94631	-77.0739	2nd Quintile
3	38.94924	-77.0583	2nd Quintile
3	38.96467	-77.0794	2nd Quintile
3	38.94129	-77.0968	2nd Quintile
3	38.95828	-77.0838	2nd Quintile
3	38.95704	-77.0716	2nd Quintile
3	38.92081	-77.0968	2nd Quintile
3	38.94758	-77.0669	2nd Quintile
3	38.95592	-77.0803	2nd Quintile
3	38.9597	-77.0681	2nd Quintile
3	38.93949	-77.0861	2nd Quintile
3	38.94129	-77.0889	2nd Quintile
3	38.94966	-77.0604	2nd Quintile
3	38.92755	-77.0861	2nd Quintile
3	38.93563	-77.1059	2nd Quintile
3	38.96434	-77.0797	2nd Quintile
3	38.95468	-77.085	2nd Quintile
3	38.92256	-77.0773	2nd Quintile
3	38.91758	-77.0967	2nd Quintile
3	38.92684	-77.0731	2nd Quintile
3	38.92753	-77.076	2nd Quintile
3	38.93745	-77.0953	2nd Quintile

3	38.93496	-77.1087	2nd Quintile
3	38.93356	-77.0973	2nd Quintile
3	38.92743	-77.0553	2nd Quintile
3	38.94312	-77.0676	2nd Quintile
3	38.96438	-77.0678	2nd Quintile
3	38.92474	-77.0731	2nd Quintile
3	38.95458	-77.0838	2nd Quintile
3	38.92045	-77.0735	2nd Quintile
3	38.97045	-77.0707	2nd Quintile
3	38.95195	-77.0661	2nd Quintile
3	38.96311	-77.0705	2nd Quintile
3	38.96402	-77.0798	2nd Quintile
3	38.95569	-77.0724	2nd Quintile
3	38.96491	-77.0772	2nd Quintile
3	38.92712	-77.0632	2nd Quintile
3	38.95758	-77.0714	2nd Quintile
3	38.96582	-77.0753	2nd Quintile
3	38.96208	-77.0718	2nd Quintile
3	38.96762	-77.0735	2nd Quintile
3	38.944	-77.0742	2nd Quintile
3	38.96643	-77.0764	2nd Quintile
3	38.95836	-77.0755	2nd Quintile
3	38.91518	-77.0912	2nd Quintile
3	38.92621	-77.0746	2nd Quintile
3	38.96584	-77.0725	2nd Quintile
3	38.92472	-77.0951	2nd Quintile
3	38.95627	-77.076	2nd Quintile
3	38.92069	-77.0756	2nd Quintile
3	38.96762	-77.0748	2nd Quintile
3	38.92909	-77.0838	2nd Quintile
3	38.95762	-77.0691	2nd Quintile
3	38.9537	-77.0795	2nd Quintile
3	38.93012	-77.0887	2nd Quintile
3	38.95239	-77.0887	2nd Quintile
3	38.95203	-77.0944	2nd Quintile
3	38.95619	-77.0704	2nd Quintile
3	38.93741	-77.1019	2nd Quintile
3	38.95661	-77.0664	2nd Quintile
3	38.93128	-77.1075	2nd Quintile
3	38.96304	-77.0672	2nd Quintile
3	38.9631	-77.0734	2nd Quintile
3	38.95145	-77.084	2nd Quintile
3	38.9407	-77.1008	2nd Quintile
3	38.95902	-77.0756	2nd Quintile
3	38.93142	-77.0663	2nd Quintile
3	38.92331	-77.0731	2nd Quintile
3	38.95469	-77.089	2nd Quintile

3	38.92894	-77.0579	2nd Quintile
3	38.92439	-77.0672	2nd Quintile
3	38.92825	-77.0576	2nd Quintile
3	38.95759	-77.0841	2nd Quintile
3	38.93027	-77.0902	2nd Quintile
3	38.92411	-77.0732	2nd Quintile
3	38.94555	-77.0777	2nd Quintile
3	38.9282	-77.0886	1st Quintile
3	38.9403	-77.0979	1st Quintile
3	38.94192	-77.0988	1st Quintile
3	38.95142	-77.0724	1st Quintile
3	38.95743	-77.0667	1st Quintile
3	38.91945	-77.0922	1st Quintile
3	38.9317	-77.0687	1st Quintile
3	38.92788	-77.053	1st Quintile
3	38.93465	-77.0669	1st Quintile
3	38.95143	-77.0712	1st Quintile
3	38.94812	-77.0944	1st Quintile
3	38.918	-77.0729	1st Quintile
3	38.94791	-77.0998	1st Quintile
3	38.93899	-77.0667	1st Quintile
3	38.94965	-77.0862	1st Quintile
3	38.94791	-77.0949	1st Quintile
3	38.96865	-77.0711	1st Quintile
3	38.9597	-77.0707	1st Quintile
3	38.92476	-77.092	1st Quintile
3	38.91922	-77.0984	1st Quintile
3	38.92644	-77.0686	1st Quintile
3	38.96587	-77.0792	1st Quintile
3	38.91901	-77.0738	1st Quintile
3	38.96231	-77.0803	1st Quintile
3	38.92716	-77.0686	1st Quintile
3	38.93692	-77.1011	1st Quintile
3	38.94397	-77.0909	1st Quintile
3	38.91983	-77.0741	1st Quintile
3	38.95836	-77.0783	1st Quintile
3	38.91701	-77.0733	1st Quintile
3	38.94223	-77.0966	1st Quintile
3	38.92988	-77.1072	1st Quintile
3	38.91108	-77.0813	1st Quintile
3	38.92991	-77.1067	1st Quintile
3	38.95444	-77.0824	1st Quintile
3	38.94126	-77.099	1st Quintile
3	38.92241	-77.0987	1st Quintile
3	38.94656	-77.0674	1st Quintile
3	38.95598	-77.0867	1st Quintile
3	38.93069	-77.107	1st Quintile

3	38.92948	-77.0658	1st Quintile
3	38.95333	-77.0938	1st Quintile
3	38.96266	-77.0803	1st Quintile
3	38.94451	-77.0724	1st Quintile
3	38.94673	-77.0651	1st Quintile
3	38.96401	-77.0792	1st Quintile
3	38.93465	-77.0681	1st Quintile
3	38.95526	-77.0803	1st Quintile
3	38.9597	-77.0759	1st Quintile
3	38.92132	-77.0731	1st Quintile
3	38.94556	-77.0838	1st Quintile
3	38.93031	-77.1014	1st Quintile
3	38.9621	-77.0752	1st Quintile
3	38.92677	-77.1018	1st Quintile
3	38.95591	-77.0887	1st Quintile
3	38.93026	-77.0872	1st Quintile
3	38.91919	-77.0964	1st Quintile
3	38.9488	-77.0687	1st Quintile
3	38.96583	-77.0783	1st Quintile
3	38.94631	-77.0821	1st Quintile
3	38.92854	-77.0886	1st Quintile
3	38.95549	-77.0732	1st Quintile
3	38.91934	-77.0574	1st Quintile
3	38.93021	-77.0613	1st Quintile
3	38.95704	-77.0772	1st Quintile
3	38.92438	-77.1023	1st Quintile
3	38.94185	-77.0545	1st Quintile
3	38.94479	-77.0812	1st Quintile
3	38.94478	-77.0905	1st Quintile
3	38.93243	-77.089	1st Quintile
3	38.94314	-77.0926	1st Quintile
3	38.95473	-77.0865	1st Quintile
3	38.9303	-77.1069	1st Quintile
3	38.91921	-77.0943	1st Quintile
3	38.92129	-77.074	1st Quintile
3	38.9491	-77.0802	1st Quintile
3	38.94631	-77.0952	1st Quintile
3	38.93028	-77.0876	1st Quintile
3	38.93403	-77.0576	1st Quintile
3	38.92564	-77.0515	1st Quintile
3	38.92888	-77.0875	1st Quintile
3	38.93781	-77.0717	1st Quintile
3	38.95104	-77.0863	1st Quintile
3	38.92956	-77.0838	1st Quintile
3	38.92655	-77.052	1st Quintile
3	38.91977	-77.0956	1st Quintile
3	38.93242	-77.0896	1st Quintile

3	38.92886	-77.0869	1st Quintile
3	38.94735	-77.0886	1st Quintile
3	38.9283	-77.0551	1st Quintile
3	38.94399	-77.0849	1st Quintile
3	38.93136	-77.0879	1st Quintile
3	38.942	-77.0878	1st Quintile
3	38.94138	-77.07	1st Quintile
3	38.95212	-77.087	1st Quintile
3	38.95235	-77.085	1st Quintile
3	38.9076	-77.0816	1st Quintile
3	38.94873	-77.0968	1st Quintile
3	38.92725	-77.1038	1st Quintile
3	38.91734	-77.0964	1st Quintile
3	38.91985	-77.0922	1st Quintile
3	38.9512	-77.0837	1st Quintile
3	38.92495	-77.0945	1st Quintile
3	38.92482	-77.062	1st Quintile
3	38.92818	-77.099	1st Quintile
3	38.94213	-77.0542	1st Quintile
3	38.94789	-77.0578	1st Quintile
3	38.93142	-77.1083	1st Quintile
4	38.98833	-77.0354	5th Quintile
4	38.97842	-77.0334	5th Quintile
4	38.95988	-77.0245	5th Quintile
4	38.94456	-77.0193	5th Quintile
4	38.93974	-77.0297	5th Quintile
4	38.9506	-77.0349	5th Quintile
4	38.96675	-77.0639	5th Quintile
4	38.97128	-77.0117	5th Quintile
4	38.98795	-77.0345	5th Quintile
4	38.96756	-77.0297	5th Quintile
4	38.96979	-77.0561	5th Quintile
4	38.95333	-77.0141	5th Quintile
4	38.95006	-77.0163	5th Quintile
4	38.95929	-77.0588	5th Quintile
4	38.96505	-77.0137	5th Quintile
4	38.95745	-77.0258	5th Quintile
4	38.98835	-77.0375	5th Quintile
4	38.95685	-77.0258	5th Quintile
4	38.96931	-77.0689	5th Quintile
4	38.98735	-77.0399	5th Quintile
4	38.95973	-77.0241	5th Quintile
4	38.96712	-77.036	5th Quintile
4	38.96123	-77.0286	5th Quintile
4	38.94837	-77.022	5th Quintile
4	38.96044	-77.0297	5th Quintile
4	38.97188	-77.0573	5th Quintile

4	38.94189	-77.0322	5th Quintile
4	38.9443	-77.0161	5th Quintile
4	38.96993	-77.0242	5th Quintile
4	38.95003	-77.0168	5th Quintile
4	38.98611	-77.0389	5th Quintile
4	38.96823	-77.0105	5th Quintile
4	38.94918	-77.0209	5th Quintile
4	38.96725	-77.026	5th Quintile
4	38.96612	-77.0179	5th Quintile
4	38.95953	-77.0235	5th Quintile
4	38.9592	-77.0224	5th Quintile
4	38.95662	-77.0076	5th Quintile
4	38.95178	-77.0346	5th Quintile
4	38.96598	-77.059	5th Quintile
4	38.96059	-77.0267	5th Quintile
4	38.96104	-77.0585	5th Quintile
4	38.99132	-77.0379	5th Quintile
4	38.96581	-77.0678	5th Quintile
4	38.98723	-77.0416	5th Quintile
4	38.96998	-77.0142	5th Quintile
4	38.98549	-77.0355	5th Quintile
4	38.95938	-77.023	5th Quintile
4	38.97474	-77.0139	5th Quintile
4	38.95876	-77.0169	5th Quintile
4	38.94081	-77.0297	5th Quintile
4	38.97173	-77.0614	5th Quintile
4	38.95981	-77.0642	5th Quintile
4	38.96093	-77.0366	5th Quintile
4	38.94639	-77.0176	5th Quintile
4	38.96492	-77.0199	5th Quintile
4	38.98037	-77.0357	5th Quintile
4	38.96551	-77.026	5th Quintile
4	38.95844	-76.9964	5th Quintile
4	38.97869	-77.0351	5th Quintile
4	38.95682	-77.0116	5th Quintile
4	38.95713	-77.0241	5th Quintile
4	38.9612	-77.0575	5th Quintile
4	38.94189	-77.0216	5th Quintile
4	38.96693	-77.0593	5th Quintile
4	38.96532	-77.0162	5th Quintile
4	38.98571	-77.0404	5th Quintile
4	38.9599	-76.9968	5th Quintile
4	38.94614	-77.0262	5th Quintile
4	38.96417	-77.0136	5th Quintile
4	38.97283	-77.0699	5th Quintile
4	38.96864	-77.0694	5th Quintile
4	38.95084	-77.0193	5th Quintile

4	38.94719	-77.0278	5th Quintile
4	38.9638	-77.0222	5th Quintile
4	38.96977	-77.0614	5th Quintile
4	38.96976	-77.0657	5th Quintile
4	38.97359	-77.0628	5th Quintile
4	38.95874	-77.0161	5th Quintile
4	38.97284	-77.062	5th Quintile
4	38.99102	-77.038	5th Quintile
4	38.95079	-77.0281	5th Quintile
4	38.96001	-77.0297	5th Quintile
4	38.94996	-77.0175	5th Quintile
4	38.96001	-77.0575	5th Quintile
4	38.93886	-77.0282	5th Quintile
4	38.97246	-77.0154	5th Quintile
4	38.9533	-77.0297	5th Quintile
4	38.95184	-77.032	5th Quintile
4	38.96271	-77.0201	5th Quintile
4	38.94622	-77.0194	5th Quintile
4	38.9627	-77.0122	5th Quintile
4	38.95665	-77.0136	5th Quintile
4	38.96197	-77.0287	5th Quintile
4	38.96998	-77.0617	5th Quintile
4	38.93761	-77.0261	5th Quintile
4	38.9794	-77.0288	5th Quintile
4	38.95146	-77.0276	5th Quintile
4	38.97035	-77.0334	5th Quintile
4	38.95164	-77.0221	5th Quintile
4	38.99063	-77.0456	5th Quintile
4	38.95823	-76.9941	5th Quintile
4	38.95031	-77.022	5th Quintile
4	38.95007	-77.0158	5th Quintile
4	38.94187	-77.0313	5th Quintile
4	38.97079	-77.0651	5th Quintile
4	38.96495	-77.0147	5th Quintile
4	38.96274	-76.9986	5th Quintile
4	38.9444	-77.012	5th Quintile
4	38.94742	-77.0184	5th Quintile
4	38.96035	-77.0048	5th Quintile
4	38.96107	-77.0565	5th Quintile
4	38.95559	-77.013	5th Quintile
4	38.96495	-77.0629	5th Quintile
4	38.95865	-77.018	5th Quintile
4	38.96615	-77.0226	5th Quintile
4	38.94078	-77.0468	5th Quintile
4	38.95199	-77.0227	5th Quintile
4	38.9704	-77.0558	5th Quintile
4	38.97872	-77.0279	5th Quintile

4	38.96977	-77.0691	5th Quintile
4	38.98811	-77.0378	5th Quintile
4	38.94827	-77.0306	5th Quintile
4	38.98335	-77.0334	5th Quintile
4	38.96106	-77.058	5th Quintile
4	38.99216	-77.0386	5th Quintile
4	38.96052	-77.0036	5th Quintile
4	38.95425	-77.0262	5th Quintile
4	38.94905	-77.0253	5th Quintile
4	38.98116	-77.0387	5th Quintile
4	38.95856	-77.0208	5th Quintile
4	38.95682	-76.9996	5th Quintile
4	38.96815	-77.0613	5th Quintile
4	38.988	-77.0382	5th Quintile
4	38.96496	-77.0164	5th Quintile
4	38.96601	-77.0572	5th Quintile
4	38.97388	-77.0144	5th Quintile
4	38.94831	-77.0249	5th Quintile
4	38.96681	-77.0612	5th Quintile
4	38.97582	-77.0263	5th Quintile
4	38.94311	-77.014	5th Quintile
4	38.98459	-77.0302	5th Quintile
4	38.9673	-77.0586	4th Quintile
4	38.97262	-77.0602	4th Quintile
4	38.96091	-77.0274	4th Quintile
4	38.98603	-77.0396	4th Quintile
4	38.96978	-77.0624	4th Quintile
4	38.94593	-77.0297	4th Quintile
4	38.97228	-77.0588	4th Quintile
4	38.96305	-77.0562	4th Quintile
4	38.95112	-77.0167	4th Quintile
4	38.98724	-77.0403	4th Quintile
4	38.95922	-77.0244	4th Quintile
4	38.97052	-77.0561	4th Quintile
4	38.95405	-77.0352	4th Quintile
4	38.96818	-77.0113	4th Quintile
4	38.98322	-77.0369	4th Quintile
4	38.9498	-77.0245	4th Quintile
4	38.94507	-77.0265	4th Quintile
4	38.94535	-77.0327	4th Quintile
4	38.98387	-77.0334	4th Quintile
4	38.94829	-77.0257	4th Quintile
4	38.98647	-77.039	4th Quintile
4	38.95626	-77.0277	4th Quintile
4	38.94507	-77.041	4th Quintile
4	38.96089	-77.0279	4th Quintile
4	38.98909	-77.0425	4th Quintile

4	38.9871	-77.0407	4th Quintile
4	38.98804	-77.0348	4th Quintile
4	38.97208	-77.0609	4th Quintile
4	38.94818	-77.0237	4th Quintile
4	38.98377	-77.0297	4th Quintile
4	38.97364	-77.0605	4th Quintile
4	38.94627	-77.0225	4th Quintile
4	38.96332	-77.0664	4th Quintile
4	38.97211	-77.0624	4th Quintile
4	38.98152	-77.0297	4th Quintile
4	38.96455	-77.0664	4th Quintile
4	38.98689	-77.0397	4th Quintile
4	38.9659	-77.062	4th Quintile
4	38.95075	-77.0238	4th Quintile
4	38.93703	-77.0295	4th Quintile
4	38.96578	-77.0225	4th Quintile
4	38.94188	-77.04	4th Quintile
4	38.97405	-77.0664	4th Quintile
4	38.96378	-77.0639	4th Quintile
4	38.9724	-77.0605	4th Quintile
4	38.98655	-77.0397	4th Quintile
4	38.96497	-77.0182	4th Quintile
4	38.96451	-77.0632	4th Quintile
4	38.9642	-77.0635	4th Quintile
4	38.95218	-77.0159	4th Quintile
4	38.97126	-77.058	4th Quintile
4	38.98599	-77.0381	4th Quintile
4	38.98227	-77.057	4th Quintile
4	38.95843	-77.0224	4th Quintile
4	38.97241	-77.0141	4th Quintile
4	38.93713	-77.0253	4th Quintile
4	38.99149	-77.0374	4th Quintile
4	38.9888	-77.032	4th Quintile
4	38.96762	-77.0656	4th Quintile
4	38.98585	-77.0372	4th Quintile
4	38.94332	-77.0327	4th Quintile
4	38.95902	-77.0219	4th Quintile
4	38.94614	-77.0328	4th Quintile
4	38.97386	-77.061	4th Quintile
4	38.97582	-77.0214	4th Quintile
4	38.93997	-77.0174	4th Quintile
4	38.94701	-77.0236	4th Quintile
4	38.96404	-77.0676	4th Quintile
4	38.99188	-77.0383	4th Quintile
4	38.9529	-77.0335	4th Quintile
4	38.94717	-77.0195	4th Quintile
4	38.9742	-77.0686	4th Quintile

4	38.98768	-77.0418	4th Quintile
4	38.96688	-77.0114	4th Quintile
4	38.98785	-77.0338	4th Quintile
4	38.98322	-77.034	4th Quintile
4	38.94045	-77.0162	4th Quintile
4	38.95956	-77.0575	4th Quintile
4	38.97869	-77.0312	4th Quintile
4	38.94675	-77.0215	4th Quintile
4	38.9881	-77.041	4th Quintile
4	38.96976	-77.0665	4th Quintile
4	38.96721	-77.0609	4th Quintile
4	38.96672	-77.0648	4th Quintile
4	38.99163	-77.0381	4th Quintile
4	38.95934	-77.0001	4th Quintile
4	38.97206	-77.059	4th Quintile
4	38.96137	-77.0659	4th Quintile
4	38.96462	-77.0087	4th Quintile
4	38.95189	-77.0305	4th Quintile
4	38.96105	-77.0661	4th Quintile
4	38.93914	-77.0249	4th Quintile
4	38.94852	-77.0185	4th Quintile
4	38.94973	-77.0274	4th Quintile
4	38.95224	-77.0149	4th Quintile
4	38.97122	-77.0712	4th Quintile
4	38.94187	-77.0318	4th Quintile
4	38.94814	-77.0157	4th Quintile
4	38.97146	-77.0151	4th Quintile
4	38.94559	-77.0297	4th Quintile
4	38.97237	-77.0256	4th Quintile
4	38.94841	-77.0209	4th Quintile
4	38.96684	-77.0301	4th Quintile
4	38.987	-77.0411	4th Quintile
4	38.96974	-77.062	4th Quintile
4	38.96642	-77.0581	4th Quintile
4	38.96631	-77.009	4th Quintile
4	38.95652	-77.0258	4th Quintile
4	38.96762	-77.0663	4th Quintile
4	38.98783	-77.039	4th Quintile
4	38.94083	-77.0209	4th Quintile
4	38.95516	-77.0282	4th Quintile
4	38.9509	-77.0232	4th Quintile
4	38.97202	-77.0636	4th Quintile
4	38.96978	-77.0674	4th Quintile
4	38.9663	-77.026	4th Quintile
4	38.98705	-77.0349	4th Quintile
4	38.98843	-77.0406	4th Quintile
4	38.94844	-77.0226	4th Quintile

4	38.96571	-77.0576	4th Quintile
4	38.98474	-77.0311	4th Quintile
4	38.94939	-77.0196	4th Quintile
4	38.9478	-77.0174	4th Quintile
4	38.95688	-77.0223	4th Quintile
4	38.961	-76.998	4th Quintile
4	38.9405	-77.0211	4th Quintile
4	38.95679	-77.0148	4th Quintile
4	38.96978	-77.0552	4th Quintile
4	38.96822	-77.0109	4th Quintile
4	38.98785	-77.0415	4th Quintile
4	38.97285	-77.0694	4th Quintile
4	38.96073	-77.0575	4th Quintile
4	38.98094	-77.0584	4th Quintile
4	38.96064	-77.028	4th Quintile
4	38.9823	-77.0362	4th Quintile
4	38.97038	-77.0285	4th Quintile
4	38.98869	-77.0383	4th Quintile
4	38.94507	-77.0326	4th Quintile
4	38.94001	-77.0169	4th Quintile
4	38.94623	-77.0229	3rd Quintile
4	38.96071	-76.9977	3rd Quintile
4	38.93867	-77.0285	3rd Quintile
4	38.98741	-77.0366	3rd Quintile
4	38.98747	-77.0331	3rd Quintile
4	38.94842	-77.027	3rd Quintile
4	38.95837	-77.0201	3rd Quintile
4	38.95842	-77.0577	3rd Quintile
4	38.99224	-77.0379	3rd Quintile
4	38.96508	-77.0225	3rd Quintile
4	38.96701	-77.0276	3rd Quintile
4	38.93989	-77.0202	3rd Quintile
4	38.97285	-77.0671	3rd Quintile
4	38.94464	-77.0218	3rd Quintile
4	38.94713	-77.0269	3rd Quintile
4	38.98912	-77.0407	3rd Quintile
4	38.9675	-77.0556	3rd Quintile
4	38.96387	-77.0137	3rd Quintile
4	38.96584	-77.0682	3rd Quintile
4	38.95543	-77.0185	3rd Quintile
4	38.96978	-77.0604	3rd Quintile
4	38.96978	-77.0575	3rd Quintile
4	38.96977	-77.0682	3rd Quintile
4	38.96583	-77.0625	3rd Quintile
4	38.98984	-77.04	3rd Quintile
4	38.95767	-77.0117	3rd Quintile
4	38.9662	-77.0617	3rd Quintile

4	38.97973	-77.0245	3rd Quintile
4	38.98799	-77.0426	3rd Quintile
4	38.9685	-77.0573	3rd Quintile
4	38.97875	-77.0297	3rd Quintile
4	38.98489	-77.0324	3rd Quintile
4	38.98832	-77.0428	3rd Quintile
4	38.9899	-77.0434	3rd Quintile
4	38.94836	-77.023	3rd Quintile
4	38.94084	-77.0424	3rd Quintile
4	38.97224	-77.013	3rd Quintile
4	38.94189	-77.0262	3rd Quintile
4	38.96413	-77.0625	3rd Quintile
4	38.94679	-77.0194	3rd Quintile
4	38.98912	-77.0397	3rd Quintile
4	38.94089	-77.0472	3rd Quintile
4	38.97285	-77.015	3rd Quintile
4	38.97539	-77.0582	3rd Quintile
4	38.96817	-77.0552	3rd Quintile
4	38.94982	-77.0238	3rd Quintile
4	38.96322	-77.0333	3rd Quintile
4	38.9654	-77.0225	3rd Quintile
4	38.97201	-77.0713	3rd Quintile
4	38.96768	-77.0355	3rd Quintile
4	38.97112	-77.0621	3rd Quintile
4	38.99023	-77.0432	3rd Quintile
4	38.93869	-77.0273	3rd Quintile
4	38.98927	-77.0432	3rd Quintile
4	38.98884	-77.0398	3rd Quintile
4	38.9401	-77.0297	3rd Quintile
4	38.94566	-77.0265	3rd Quintile
4	38.9525	-77.0346	3rd Quintile
4	38.96614	-77.0331	3rd Quintile
4	38.98893	-77.0429	3rd Quintile
4	38.99259	-77.0409	3rd Quintile
4	38.98946	-77.042	3rd Quintile
4	38.98755	-77.0423	3rd Quintile
4	38.96999	-77.0537	3rd Quintile
4	38.94315	-77.0259	3rd Quintile
4	38.96646	-77.0615	3rd Quintile
4	38.94235	-77.0217	3rd Quintile
4	38.9698	-77.0697	3rd Quintile
4	38.96566	-77.0622	3rd Quintile
4	38.96977	-77.0644	3rd Quintile
4	38.94507	-77.0335	3rd Quintile
4	38.98996	-77.0414	3rd Quintile
4	38.96741	-77.0546	3rd Quintile
4	38.97033	-77.0549	3rd Quintile

4	38.99071	-77.0388	3rd Quintile
4	38.97175	-77.0716	3rd Quintile
4	38.98136	-77.0356	3rd Quintile
4	38.98865	-77.0393	3rd Quintile
4	38.9704	-77.0536	3rd Quintile
4	38.95663	-77.0089	3rd Quintile
4	38.96874	-77.0538	3rd Quintile
4	38.96274	-77.0161	3rd Quintile
4	38.97067	-77.0335	3rd Quintile
4	38.95824	-77.0116	3rd Quintile
4	38.96562	-77.0565	3rd Quintile
4	38.96391	-77.0664	3rd Quintile
4	38.96286	-77.0664	3rd Quintile
4	38.96496	-77.0228	3rd Quintile
4	38.94913	-77.0271	3rd Quintile
4	38.96896	-77.009	3rd Quintile
4	38.97943	-77.0361	3rd Quintile
4	38.99089	-77.0353	3rd Quintile
4	38.9842	-77.0365	3rd Quintile
4	38.98565	-77.0364	3rd Quintile
4	38.95146	-77.023	3rd Quintile
4	38.96583	-77.063	3rd Quintile
4	38.96017	-77.0252	3rd Quintile
4	38.9815	-77.0334	3rd Quintile
4	38.94831	-77.0301	3rd Quintile
4	38.95392	-77.0177	3rd Quintile
4	38.97207	-77.0697	3rd Quintile
4	38.96864	-77.0653	3rd Quintile
4	38.94303	-77.023	3rd Quintile
4	38.98183	-77.0291	3rd Quintile
4	38.95928	-77.0359	3rd Quintile
4	38.96866	-77.016	3rd Quintile
4	38.98936	-77.0393	3rd Quintile
4	38.98658	-77.0364	3rd Quintile
4	38.97936	-77.0317	3rd Quintile
4	38.94806	-77.027	3rd Quintile
4	38.95415	-77.0272	3rd Quintile
4	38.94425	-77.0176	3rd Quintile
4	38.96584	-77.0663	3rd Quintile
4	38.9627	-77.0137	3rd Quintile
4	38.97387	-77.0616	3rd Quintile
4	38.96899	-77.0291	3rd Quintile
4	38.9661	-77.0162	3rd Quintile
4	38.95124	-77.0347	3rd Quintile
4	38.99261	-77.039	3rd Quintile
4	38.95352	-77.035	3rd Quintile
4	38.98217	-77.0379	3rd Quintile

4	38.93873	-77.0327	3rd Quintile
4	38.97285	-77.0689	3rd Quintile
4	38.96271	-77.028	3rd Quintile
4	38.98021	-77.0245	3rd Quintile
4	38.97207	-77.0686	3rd Quintile
4	38.96735	-77.0137	3rd Quintile
4	38.94024	-77.0213	3rd Quintile
4	38.97581	-77.0202	3rd Quintile
4	38.94903	-77.0262	3rd Quintile
4	38.97082	-77.0575	3rd Quintile
4	38.95609	-77.0335	3rd Quintile
4	38.94397	-77.0235	3rd Quintile
4	38.96674	-77.0652	3rd Quintile
4	38.94723	-77.0251	3rd Quintile
4	38.97148	-77.0598	3rd Quintile
4	38.93882	-77.0201	3rd Quintile
4	38.95874	-77.019	3rd Quintile
4	38.95837	-77.0177	3rd Quintile
4	38.98119	-77.0285	3rd Quintile
4	38.94189	-77.0397	3rd Quintile
4	38.96882	-77.0561	3rd Quintile
4	38.95151	-77.0297	3rd Quintile
4	38.9731	-77.0611	3rd Quintile
4	38.96614	-77.0327	3rd Quintile
4	38.95968	-76.9965	3rd Quintile
4	38.94846	-77.0174	3rd Quintile
4	38.94085	-77.0431	2nd Quintile
4	38.96685	-77.0363	2nd Quintile
4	38.95767	-77.0093	2nd Quintile
4	38.96376	-77.0226	2nd Quintile
4	38.95741	-77.0003	2nd Quintile
4	38.96993	-77.0331	2nd Quintile
4	38.95276	-77.0297	2nd Quintile
4	38.98272	-77.0279	2nd Quintile
4	38.97172	-77.0634	2nd Quintile
4	38.94056	-77.0252	2nd Quintile
4	38.94613	-77.0313	2nd Quintile
4	38.98117	-77.0295	2nd Quintile
4	38.94989	-77.0215	2nd Quintile
4	38.97717	-77.0339	2nd Quintile
4	38.93834	-77.0227	2nd Quintile
4	38.97945	-77.0335	2nd Quintile
4	38.93762	-77.0297	2nd Quintile
4	38.9519	-77.0277	2nd Quintile
4	38.95542	-77.0257	2nd Quintile
4	38.98039	-77.0324	2nd Quintile
4	38.95662	-77.0124	2nd Quintile

4	38.96865	-77.067	2nd Quintile
4	38.96864	-77.0657	2nd Quintile
4	38.95081	-77.0352	2nd Quintile
4	38.97015	-77.0623	2nd Quintile
4	38.94042	-77.0297	2nd Quintile
4	38.9855	-77.0311	2nd Quintile
4	38.94443	-77.0262	2nd Quintile
4	38.95901	-76.9954	2nd Quintile
4	38.93975	-77.0324	2nd Quintile
4	38.9702	-77.0117	2nd Quintile
4	38.98497	-77.0286	2nd Quintile
4	38.959	-77.0648	2nd Quintile
4	38.96788	-77.0124	2nd Quintile
4	38.96751	-77.0334	2nd Quintile
4	38.97941	-77.0273	2nd Quintile
4	38.95331	-77.0117	2nd Quintile
4	38.9627	-77.0116	2nd Quintile
4	38.96273	-77.0626	2nd Quintile
4	38.98431	-77.0372	2nd Quintile
4	38.95929	-77.0336	2nd Quintile
4	38.95682	-77.0335	2nd Quintile
4	38.97942	-77.0244	2nd Quintile
4	38.94984	-77.0231	2nd Quintile
4	38.95857	-76.9948	2nd Quintile
4	38.95056	-77.0195	2nd Quintile
4	38.98117	-77.0582	2nd Quintile
4	38.94834	-77.0241	2nd Quintile
4	38.94081	-77.0367	2nd Quintile
4	38.98361	-77.0528	2nd Quintile
4	38.95192	-77.0254	2nd Quintile
4	38.97699	-77.0266	2nd Quintile
4	38.95108	-77.0179	2nd Quintile
4	38.96361	-77.0162	2nd Quintile
4	38.98717	-77.0328	2nd Quintile
4	38.96132	-77.0281	2nd Quintile
4	38.98404	-77.0324	2nd Quintile
4	38.95931	-77.0369	2nd Quintile
4	38.96018	-77.017	2nd Quintile
4	38.95828	-77.0315	2nd Quintile
4	38.96273	-77.0172	2nd Quintile
4	38.97581	-77.0218	2nd Quintile
4	38.95748	-77.0174	2nd Quintile
4	38.96048	-77.0028	2nd Quintile
4	38.96194	-77.0611	2nd Quintile
4	38.94831	-77.0345	2nd Quintile
4	38.96594	-77.0277	2nd Quintile
4	38.94742	-77.019	2nd Quintile

4	38.9611	-77.0597	2nd Quintile
4	38.96021	-77.0199	2nd Quintile
4	38.96379	-77.0271	2nd Quintile
4	38.95971	-77.0588	2nd Quintile
4	38.99101	-77.0349	2nd Quintile
4	38.9794	-77.0292	2nd Quintile
4	38.94079	-77.0455	2nd Quintile
4	38.94664	-77.0236	2nd Quintile
4	38.94778	-77.0268	2nd Quintile
4	38.96382	-77.0623	2nd Quintile
4	38.94446	-77.0172	2nd Quintile
4	38.95479	-77.0279	2nd Quintile
4	38.95887	-77.0212	2nd Quintile
4	38.97287	-77.0703	2nd Quintile
4	38.94776	-77.0254	2nd Quintile
4	38.93762	-77.032	2nd Quintile
4	38.9593	-77.0116	2nd Quintile
4	38.96192	-77.029	2nd Quintile
4	38.96061	-77.0588	2nd Quintile
4	38.95	-77.0179	2nd Quintile
4	38.94908	-77.0241	2nd Quintile
4	38.95542	-77.0179	2nd Quintile
4	38.98789	-77.0467	2nd Quintile
4	38.96614	-77.0363	2nd Quintile
4	38.97403	-77.0675	2nd Quintile
4	38.96898	-77.0281	2nd Quintile
4	38.96324	-77.0028	2nd Quintile
4	38.94979	-77.0249	2nd Quintile
4	38.96977	-77.0677	2nd Quintile
4	38.95189	-77.0297	2nd Quintile
4	38.94743	-77.0269	2nd Quintile
4	38.94481	-77.0263	2nd Quintile
4	38.94317	-77.0182	2nd Quintile
4	38.94863	-77.0237	2nd Quintile
4	38.96099	-77.0646	2nd Quintile
4	38.97581	-77.0223	2nd Quintile
4	38.94635	-77.0191	2nd Quintile
4	38.96721	-77.0242	2nd Quintile
4	38.95415	-77.0257	2nd Quintile
4	38.98229	-77.0297	2nd Quintile
4	38.96323	-77.0614	2nd Quintile
4	38.98035	-77.0279	2nd Quintile
4	38.96993	-77.03	2nd Quintile
4	38.94828	-77.0314	2nd Quintile
4	38.98416	-77.0338	2nd Quintile
4	38.9577	-77.0135	2nd Quintile
4	38.95821	-77.0297	2nd Quintile

4	38.97079	-77.0233	2nd Quintile
4	38.96463	-77.0574	2nd Quintile
4	38.9804	-77.0307	2nd Quintile
4	38.98068	-77.0245	2nd Quintile
4	38.94617	-77.0218	2nd Quintile
4	38.96213	-77.0295	2nd Quintile
4	38.9441	-77.0229	2nd Quintile
4	38.96273	-77.0143	2nd Quintile
4	38.94007	-77.0162	2nd Quintile
4	38.94842	-77.0354	2nd Quintile
4	38.94931	-77.0328	2nd Quintile
4	38.94816	-77.0195	2nd Quintile
4	38.93995	-77.0182	2nd Quintile
4	38.96182	-77.0563	1st Quintile
4	38.95229	-77.014	1st Quintile
4	38.96612	-77.0191	1st Quintile
4	38.93869	-77.0296	1st Quintile
4	38.94087	-77.0233	1st Quintile
4	38.93974	-77.0314	1st Quintile
4	38.94834	-77.0297	1st Quintile
4	38.96189	-77.0199	1st Quintile
4	38.95426	-77.0216	1st Quintile
4	38.96765	-77.0122	1st Quintile
4	38.96273	-77.0205	1st Quintile
4	38.96114	-77.0639	1st Quintile
4	38.9832	-77.0299	1st Quintile
4	38.95745	-77.0171	1st Quintile
4	38.96026	-77.0365	1st Quintile
4	38.93866	-77.0248	1st Quintile
4	38.9463	-77.0208	1st Quintile
4	38.9519	-77.0289	1st Quintile
4	38.9641	-77.0596	1st Quintile
4	38.98227	-77.0304	1st Quintile
4	38.94084	-77.04	1st Quintile
4	38.95876	-77.0116	1st Quintile
4	38.95696	-77.0156	1st Quintile
4	38.94332	-77.0155	1st Quintile
4	38.95098	-77.0211	1st Quintile
4	38.95873	-77.0586	1st Quintile
4	38.96902	-77.0338	1st Quintile
4	38.9511	-77.0171	1st Quintile
4	38.94903	-77.0353	1st Quintile
4	38.93964	-77.025	1st Quintile
4	38.97581	-77.0206	1st Quintile
4	38.94432	-77.0418	1st Quintile
4	38.95536	-77.0269	1st Quintile
4	38.95088	-77.0176	1st Quintile

4	38.94841	-77.0215	1st Quintile
4	38.9399	-77.0191	1st Quintile
4	38.93977	-77.0275	1st Quintile
4	38.94311	-77.0203	1st Quintile
4	38.9576	-77.0224	1st Quintile
4	38.97612	-77.0256	1st Quintile
4	38.96498	-77.026	1st Quintile
4	38.97075	-77.0285	1st Quintile
4	38.94907	-77.0246	1st Quintile
4	38.94702	-77.0253	1st Quintile
4	38.9521	-77.0189	1st Quintile
4	38.96595	-77.026	1st Quintile
4	38.95516	-77.0322	1st Quintile
4	38.97957	-77.0264	1st Quintile
4	38.94189	-77.0354	1st Quintile
4	38.9551	-77.0198	1st Quintile
4	38.99038	-77.0449	1st Quintile
4	38.94039	-77.0171	1st Quintile
4	38.94433	-77.0145	1st Quintile
4	38.94615	-77.0257	1st Quintile
4	38.96497	-77.0251	1st Quintile
4	38.96368	-77.0334	1st Quintile
4	38.95842	-77.0241	1st Quintile
4	38.94432	-77.0438	1st Quintile
4	38.96516	-77.0363	1st Quintile
4	38.97534	-77.0246	1st Quintile
4	38.95875	-77.0142	1st Quintile
4	38.96097	-77.0288	1st Quintile
4	38.94622	-77.0235	1st Quintile
4	38.94929	-77.0175	1st Quintile
4	38.95891	-77.0297	1st Quintile
4	38.96492	-77.0014	1st Quintile
4	38.95846	-76.9944	1st Quintile
4	38.97001	-77.0138	1st Quintile
4	38.95768	-77.0101	1st Quintile
4	38.95846	-77.009	1st Quintile
4	38.97299	-77.0132	1st Quintile
4	38.96034	-77.0375	1st Quintile
4	38.94518	-77.0194	1st Quintile
4	38.94745	-77.0173	1st Quintile
4	38.94837	-77.0402	1st Quintile
4	38.96584	-77.0594	1st Quintile
4	38.941	-77.019	1st Quintile
4	38.96452	-77.0628	1st Quintile
4	38.96496	-77.0236	1st Quintile
4	38.95315	-77.0176	1st Quintile
4	38.96442	-77.0027	1st Quintile

4	38.96611	-77.0257	1st Quintile
4	38.94631	-77.0202	1st Quintile
4	38.96273	-77.0195	1st Quintile
4	38.95876	-77.0125	1st Quintile
4	38.94924	-77.0237	1st Quintile
4	38.96325	-77.0201	1st Quintile
4	38.98606	-77.0285	1st Quintile
4	38.94667	-77.0357	1st Quintile
4	38.94125	-77.0254	1st Quintile
4	38.93751	-77.0253	1st Quintile
4	38.94268	-77.0172	1st Quintile
4	38.93761	-77.0291	1st Quintile
4	38.95691	-77.0178	1st Quintile
4	38.95454	-77.0125	1st Quintile
4	38.93907	-77.0167	1st Quintile
4	38.95298	-77.0348	1st Quintile
4	38.9737	-77.0125	1st Quintile
4	38.95189	-77.0159	1st Quintile
4	38.94613	-77.0282	1st Quintile
4	38.94506	-77.0271	1st Quintile
4	38.96454	-77.0242	1st Quintile
4	38.96496	-77.0175	1st Quintile
4	38.94301	-77.0172	1st Quintile
4	38.96793	-77.0247	1st Quintile
4	38.95731	-77.0322	1st Quintile
4	38.96011	-76.9971	1st Quintile
4	38.96111	-77.0297	1st Quintile
4	38.97582	-77.0209	1st Quintile
4	38.94435	-77.0155	1st Quintile
4	38.9573	-77.0296	1st Quintile
4	38.94915	-77.0157	1st Quintile
4	38.94749	-77.0356	1st Quintile
4	38.93868	-77.0304	1st Quintile
4	38.94506	-77.0316	1st Quintile
4	38.96822	-77.0212	1st Quintile
4	38.95188	-77.0309	1st Quintile
4	38.93974	-77.0307	1st Quintile
4	38.96731	-77.0223	1st Quintile
4	38.93549	-77.0267	1st Quintile
4	38.93975	-77.0333	1st Quintile
4	38.94976	-77.0352	1st Quintile
4	38.93763	-77.0326	1st Quintile
4	38.94607	-77.0267	1st Quintile
4	38.94083	-77.0254	1st Quintile
4	38.95731	-77.0357	1st Quintile
4	38.9472	-77.0284	1st Quintile
4	38.95838	-77.0335	1st Quintile

4	38.94872	-77.0271	1st Quintile
4	38.94825	-77.0278	1st Quintile
4	38.96024	-77.0349	1st Quintile
4	38.95518	-77.0297	1st Quintile
4	38.949	-77.0311	1st Quintile
4	38.95622	-77.0329	1st Quintile
4	38.95079	-77.0274	1st Quintile
5	38.94176	-76.9763	5th Quintile
5	38.94133	-76.9762	5th Quintile
5	38.93993	-76.9762	5th Quintile
5	38.94036	-76.9761	5th Quintile
5	38.95437	-76.9898	5th Quintile
5	38.94108	-76.9783	5th Quintile
5	38.94926	-77.0064	5th Quintile
5	38.94089	-76.9789	5th Quintile
5	38.94528	-76.9885	5th Quintile
5	38.92636	-76.9822	5th Quintile
5	38.93905	-76.9931	5th Quintile
5	38.94031	-76.9754	5th Quintile
5	38.93963	-76.9903	5th Quintile
5	38.92023	-77.0008	5th Quintile
5	38.95497	-77.0016	5th Quintile
5	38.93511	-76.9798	5th Quintile
5	38.94043	-76.9767	5th Quintile
5	38.94061	-76.9774	5th Quintile
5	38.92968	-76.9887	5th Quintile
5	38.94074	-76.9761	5th Quintile
5	38.93832	-76.9737	5th Quintile
5	38.9351	-76.9785	5th Quintile
5	38.94971	-77.0065	5th Quintile
5	38.90575	-76.9808	5th Quintile
5	38.9089	-76.9823	5th Quintile
5	38.93409	-76.9798	5th Quintile
5	38.90647	-76.989	5th Quintile
5	38.91402	-77.0153	5th Quintile
5	38.93315	-76.9762	5th Quintile
5	38.93992	-76.9802	5th Quintile
5	38.9283	-76.9793	5th Quintile
5	38.95163	-76.9868	5th Quintile
5	38.92802	-76.9823	5th Quintile
5	38.93049	-76.9925	5th Quintile
5	38.9351	-76.9773	5th Quintile
5	38.94202	-76.9803	5th Quintile
5	38.92561	-76.9909	5th Quintile
5	38.93403	-76.9813	5th Quintile
5	38.9407	-76.9743	5th Quintile
5	38.921	-76.9661	5th Quintile

5	38.94072	-76.9785	5th Quintile
5	38.92238	-76.9652	5th Quintile
5	38.93116	-76.9764	5th Quintile
5	38.93548	-76.9762	5th Quintile
5	38.91262	-77.0166	5th Quintile
5	38.9186	-77.0037	5th Quintile
5	38.9341	-76.9775	5th Quintile
5	38.92487	-76.9654	5th Quintile
5	38.93167	-76.9722	5th Quintile
5	38.9572	-76.9915	5th Quintile
5	38.90029	-76.9762	5th Quintile
5	38.93832	-76.9783	5th Quintile
5	38.92658	-76.9859	5th Quintile
5	38.92023	-76.9821	5th Quintile
5	38.93115	-76.9783	5th Quintile
5	38.95216	-76.9906	5th Quintile
5	38.93311	-76.9798	5th Quintile
5	38.93793	-76.9936	5th Quintile
5	38.92814	-76.9809	5th Quintile
5	38.94257	-76.9804	5th Quintile
5	38.91153	-77.0152	5th Quintile
5	38.92603	-76.969	5th Quintile
5	38.90638	-76.9789	5th Quintile
5	38.94083	-76.9802	5th Quintile
5	38.94074	-76.9753	5th Quintile
5	38.93102	-76.9819	5th Quintile
5	38.92749	-76.9793	5th Quintile
5	38.91113	-77.0106	5th Quintile
5	38.9024	-76.9839	5th Quintile
5	38.93826	-76.9762	5th Quintile
5	38.95404	-76.9876	5th Quintile
5	38.93278	-76.9864	5th Quintile
5	38.93248	-76.9669	5th Quintile
5	38.91186	-77.0086	5th Quintile
5	38.91631	-77.0142	5th Quintile
5	38.90964	-77.0084	5th Quintile
5	38.95603	-76.9977	5th Quintile
5	38.9551	-76.9991	5th Quintile
5	38.93961	-76.9762	5th Quintile
5	38.92368	-76.9651	5th Quintile
5	38.90565	-76.9753	5th Quintile
5	38.92956	-76.9913	5th Quintile
5	38.93475	-76.9869	5th Quintile
5	38.94047	-76.9792	5th Quintile
5	38.93725	-76.9722	5th Quintile
5	38.94017	-76.9792	5th Quintile
5	38.92032	-76.9817	5th Quintile

5	38.94181	-76.9922	5th Quintile
5	38.94233	-76.9762	5th Quintile
5	38.90036	-76.979	5th Quintile
5	38.91261	-77.0154	5th Quintile
5	38.92451	-76.9723	5th Quintile
5	38.94685	-77.0084	5th Quintile
5	38.93034	-76.9742	5th Quintile
5	38.90253	-76.979	5th Quintile
5	38.93112	-76.9742	5th Quintile
5	38.956	-76.9982	5th Quintile
5	38.92131	-77.0039	5th Quintile
5	38.91409	-77.0111	4th Quintile
5	38.92235	-77.0038	4th Quintile
5	38.95414	-76.9957	4th Quintile
5	38.95496	-77.002	4th Quintile
5	38.90859	-77.0057	4th Quintile
5	38.93865	-76.9932	4th Quintile
5	38.92166	-77.0041	4th Quintile
5	38.94947	-76.9885	4th Quintile
5	38.91291	-77.0152	4th Quintile
5	38.95318	-76.9881	4th Quintile
5	38.9235	-76.9665	4th Quintile
5	38.92131	-77.0035	4th Quintile
5	38.91426	-77.0142	4th Quintile
5	38.89909	-76.9769	4th Quintile
5	38.91041	-77.0148	4th Quintile
5	38.94068	-76.9814	4th Quintile
5	38.93341	-76.9738	4th Quintile
5	38.93057	-76.9684	4th Quintile
5	38.92773	-76.986	4th Quintile
5	38.95491	-76.9901	4th Quintile
5	38.92132	-77.0106	4th Quintile
5	38.93197	-76.9684	4th Quintile
5	38.92237	-76.9637	4th Quintile
5	38.90979	-76.9865	4th Quintile
5	38.92015	-76.979	4th Quintile
5	38.93259	-76.9665	4th Quintile
5	38.92509	-76.9857	4th Quintile
5	38.94149	-77.0059	4th Quintile
5	38.93298	-76.9734	4th Quintile
5	38.93777	-76.9683	4th Quintile
5	38.90395	-76.9847	4th Quintile
5	38.93245	-76.9863	4th Quintile
5	38.92743	-76.9952	4th Quintile
5	38.95421	-76.9944	4th Quintile
5	38.92518	-76.9653	4th Quintile
5	38.94898	-77.0063	4th Quintile

5	38.93214	-76.9781	4th Quintile
5	38.90701	-76.9888	4th Quintile
5	38.92767	-76.9808	4th Quintile
5	38.93724	-76.9886	4th Quintile
5	38.95099	-76.9895	4th Quintile
5	38.9273	-76.9824	4th Quintile
5	38.93771	-76.9762	4th Quintile
5	38.92237	-76.9614	4th Quintile
5	38.9323	-76.9676	4th Quintile
5	38.93176	-76.9742	4th Quintile
5	38.9336	-76.9742	4th Quintile
5	38.91333	-77.0089	4th Quintile
5	38.90963	-77.0158	4th Quintile
5	38.92401	-76.984	4th Quintile
5	38.91701	-77.0053	4th Quintile
5	38.95125	-76.9857	4th Quintile
5	38.93	-76.9809	4th Quintile
5	38.93086	-76.9853	4th Quintile
5	38.92044	-77.0122	4th Quintile
5	38.93064	-76.9742	4th Quintile
5	38.95351	-76.9895	4th Quintile
5	38.93625	-76.9722	4th Quintile
5	38.94731	-76.9949	4th Quintile
5	38.94007	-76.9742	4th Quintile
5	38.94174	-76.9773	4th Quintile
5	38.93664	-76.9762	4th Quintile
5	38.93972	-76.9752	4th Quintile
5	38.91391	-77.0165	4th Quintile
5	38.91262	-77.0121	4th Quintile
5	38.95547	-76.9937	4th Quintile
5	38.94288	-77.0053	4th Quintile
5	38.93612	-76.9659	4th Quintile
5	38.93825	-76.9934	4th Quintile
5	38.91327	-77.0152	4th Quintile
5	38.93496	-76.9762	4th Quintile
5	38.93315	-76.9743	4th Quintile
5	38.93015	-76.9781	4th Quintile
5	38.90618	-76.9899	4th Quintile
5	38.92227	-76.961	4th Quintile
5	38.95547	-76.9941	4th Quintile
5	38.94028	-76.9927	4th Quintile
5	38.93286	-76.9639	4th Quintile
5	38.93409	-76.9762	4th Quintile
5	38.95685	-76.9911	4th Quintile
5	38.92537	-76.9905	4th Quintile
5	38.95126	-76.9895	4th Quintile
5	38.93116	-76.9756	4th Quintile

5	38.91559	-77.0071	4th Quintile
5	38.91703	-77.0102	4th Quintile
5	38.92253	-76.9665	4th Quintile
5	38.90981	-76.9878	4th Quintile
5	38.91814	-77.0004	4th Quintile
5	38.93451	-76.9916	4th Quintile
5	38.92622	-76.9859	4th Quintile
5	38.91021	-76.9972	4th Quintile
5	38.90253	-76.9818	4th Quintile
5	38.90384	-76.9895	3rd Quintile
5	38.9289	-76.9884	3rd Quintile
5	38.9192	-76.9844	3rd Quintile
5	38.95564	-76.9912	3rd Quintile
5	38.93705	-76.9762	3rd Quintile
5	38.90373	-76.9789	3rd Quintile
5	38.93115	-76.9776	3rd Quintile
5	38.9362	-76.9702	3rd Quintile
5	38.91335	-77.0126	3rd Quintile
5	38.93942	-76.9752	3rd Quintile
5	38.91631	-77.0128	3rd Quintile
5	38.91234	-77.0152	3rd Quintile
5	38.9141	-77.0135	3rd Quintile
5	38.93063	-76.995	3rd Quintile
5	38.91119	-77.0088	3rd Quintile
5	38.91215	-77.0087	3rd Quintile
5	38.94524	-76.9878	3rd Quintile
5	38.95638	-76.9954	3rd Quintile
5	38.93876	-76.9951	3rd Quintile
5	38.92931	-76.9676	3rd Quintile
5	38.93017	-76.9763	3rd Quintile
5	38.92691	-76.9822	3rd Quintile
5	38.92976	-76.9748	3rd Quintile
5	38.90793	-76.9804	3rd Quintile
5	38.92966	-76.9794	3rd Quintile
5	38.93267	-76.9661	3rd Quintile
5	38.93017	-76.9751	3rd Quintile
5	38.92774	-76.9679	3rd Quintile
5	38.94796	-76.9927	3rd Quintile
5	38.91558	-77.0049	3rd Quintile
5	38.94023	-76.9809	3rd Quintile
5	38.93688	-76.9712	3rd Quintile
5	38.94348	-76.9883	3rd Quintile
5	38.95566	-76.9985	3rd Quintile
5	38.89897	-76.9762	3rd Quintile
5	38.91259	-77.0092	3rd Quintile
5	38.91996	-76.9821	3rd Quintile
5	38.94151	-77.0053	3rd Quintile

5	38.93289	-76.9844	3rd Quintile
5	38.94095	-76.9883	3rd Quintile
5	38.95129	-76.9917	3rd Quintile
5	38.92931	-76.9702	3rd Quintile
5	38.93832	-76.9789	3rd Quintile
5	38.93178	-76.9651	3rd Quintile
5	38.90425	-76.9855	3rd Quintile
5	38.95359	-76.9925	3rd Quintile
5	38.92023	-77.0147	3rd Quintile
5	38.95061	-76.9895	3rd Quintile
5	38.94247	-76.9833	3rd Quintile
5	38.9276	-76.9823	3rd Quintile
5	38.93214	-76.9721	3rd Quintile
5	38.9539	-76.9954	3rd Quintile
5	38.93967	-76.9736	3rd Quintile
5	38.93966	-76.9729	3rd Quintile
5	38.93163	-76.9615	3rd Quintile
5	38.92243	-76.9808	3rd Quintile
5	38.90204	-76.9789	3rd Quintile
5	38.9341	-76.9779	3rd Quintile
5	38.92669	-76.9808	3rd Quintile
5	38.93967	-76.9797	3rd Quintile
5	38.93578	-76.9799	3rd Quintile
5	38.95182	-76.9896	3rd Quintile
5	38.93995	-76.9903	3rd Quintile
5	38.92698	-76.9827	3rd Quintile
5	38.9297	-76.9669	3rd Quintile
5	38.91036	-77.0081	3rd Quintile
5	38.92559	-76.9757	3rd Quintile
5	38.93786	-76.971	3rd Quintile
5	38.93139	-76.9843	3rd Quintile
5	38.92652	-76.9667	3rd Quintile
5	38.90833	-76.9827	3rd Quintile
5	38.92887	-76.9768	3rd Quintile
5	38.90945	-76.9869	3rd Quintile
5	38.95096	-76.9917	3rd Quintile
5	38.93093	-76.9794	3rd Quintile
5	38.92449	-76.9855	3rd Quintile
5	38.9126	-77.0072	3rd Quintile
5	38.91706	-77.0145	3rd Quintile
5	38.90019	-76.9743	3rd Quintile
5	38.92379	-76.9843	3rd Quintile
5	38.90588	-76.9853	3rd Quintile
5	38.93341	-76.9797	3rd Quintile
5	38.90166	-76.9863	3rd Quintile
5	38.92556	-76.9966	3rd Quintile
5	38.90342	-76.979	3rd Quintile

5	38.93936	-76.9733	3rd Quintile
5	38.91484	-77.0112	3rd Quintile
5	38.92982	-76.9762	3rd Quintile
5	38.93145	-76.9742	3rd Quintile
5	38.95455	-76.9933	3rd Quintile
5	38.93017	-76.9785	3rd Quintile
5	38.94286	-76.9764	3rd Quintile
5	38.92866	-76.9793	3rd Quintile
5	38.94074	-76.9819	3rd Quintile
5	38.9149	-77.0079	3rd Quintile
5	38.95324	-76.9946	2nd Quintile
5	38.9493	-76.995	2nd Quintile
5	38.93286	-76.9629	2nd Quintile
5	38.91702	-77.0043	2nd Quintile
5	38.92235	-76.962	2nd Quintile
5	38.95627	-76.9979	2nd Quintile
5	38.9439	-76.9762	2nd Quintile
5	38.93015	-76.9774	2nd Quintile
5	38.93126	-76.9722	2nd Quintile
5	38.93969	-76.978	2nd Quintile
5	38.91262	-77.0081	2nd Quintile
5	38.91409	-77.0115	2nd Quintile
5	38.95455	-76.9918	2nd Quintile
5	38.92239	-76.9648	2nd Quintile
5	38.94448	-76.9759	2nd Quintile
5	38.93832	-76.9722	2nd Quintile
5	38.92128	-77.0123	2nd Quintile
5	38.95162	-76.9881	2nd Quintile
5	38.92705	-76.9806	2nd Quintile
5	38.93879	-76.9762	2nd Quintile
5	38.93017	-76.9791	2nd Quintile
5	38.94134	-76.9773	2nd Quintile
5	38.94268	-76.9773	2nd Quintile
5	38.91814	-77.0136	2nd Quintile
5	38.91943	-76.9821	2nd Quintile
5	38.93378	-76.9682	2nd Quintile
5	38.92359	-76.9828	2nd Quintile
5	38.95545	-76.9922	2nd Quintile
5	38.92343	-76.9632	2nd Quintile
5	38.93477	-76.9753	2nd Quintile
5	38.9034	-76.9862	2nd Quintile
5	38.92727	-76.9797	2nd Quintile
5	38.93879	-76.9725	2nd Quintile
5	38.93013	-76.9757	2nd Quintile
5	38.94619	-77.0055	2nd Quintile
5	38.93908	-76.9883	2nd Quintile
5	38.9108	-77.0092	2nd Quintile

5	38.92872	-76.986	2nd Quintile
5	38.92556	-76.997	2nd Quintile
5	38.92418	-76.9808	2nd Quintile
5	38.93105	-76.9811	2nd Quintile
5	38.95163	-76.9887	2nd Quintile
5	38.94126	-76.991	2nd Quintile
5	38.92675	-76.9864	2nd Quintile
5	38.91409	-77.0101	2nd Quintile
5	38.93115	-76.9862	2nd Quintile
5	38.90105	-76.979	2nd Quintile
5	38.95227	-76.9917	2nd Quintile
5	38.90225	-76.9869	2nd Quintile
5	38.93083	-76.9859	2nd Quintile
5	38.94291	-76.9838	2nd Quintile
5	38.91406	-77.0148	2nd Quintile
5	38.9351	-76.9766	2nd Quintile
5	38.95547	-76.9928	2nd Quintile
5	38.92832	-76.9777	2nd Quintile
5	38.92569	-76.9858	2nd Quintile
5	38.94272	-76.9783	2nd Quintile
5	38.92816	-76.9796	2nd Quintile
5	38.93383	-76.9797	2nd Quintile
5	38.91388	-77.0172	2nd Quintile
5	38.94576	-77.0066	2nd Quintile
5	38.93079	-76.9885	2nd Quintile
5	38.91567	-76.9849	2nd Quintile
5	38.93274	-76.9873	2nd Quintile
5	38.93826	-76.9718	2nd Quintile
5	38.90211	-76.982	2nd Quintile
5	38.93921	-76.9762	2nd Quintile
5	38.93174	-76.9689	2nd Quintile
5	38.93287	-76.9655	2nd Quintile
5	38.95144	-76.9863	2nd Quintile
5	38.94428	-76.9865	2nd Quintile
5	38.93374	-76.987	2nd Quintile
5	38.93394	-76.9829	2nd Quintile
5	38.91123	-77.0162	2nd Quintile
5	38.94164	-76.9883	2nd Quintile
5	38.93032	-76.9691	2nd Quintile
5	38.92111	-76.9664	2nd Quintile
5	38.90856	-77.0155	2nd Quintile
5	38.90434	-76.9832	2nd Quintile
5	38.92107	-76.9883	2nd Quintile
5	38.92512	-76.9962	2nd Quintile
5	38.93815	-77.0069	2nd Quintile
5	38.93215	-76.9641	2nd Quintile
5	38.90504	-76.9849	2nd Quintile

5	38.91165	-77.0162	2nd Quintile
5	38.9141	-77.0126	2nd Quintile
5	38.92124	-76.9658	2nd Quintile
5	38.93737	-76.9936	2nd Quintile
5	38.92451	-76.9746	2nd Quintile
5	38.93297	-76.9927	2nd Quintile
5	38.92575	-76.9924	2nd Quintile
5	38.93454	-76.9846	2nd Quintile
5	38.92345	-77.0025	2nd Quintile
5	38.93779	-76.9688	2nd Quintile
5	38.92324	-76.9807	2nd Quintile
5	38.93833	-76.9751	2nd Quintile
5	38.91055	-77.0152	2nd Quintile
5	38.9318	-76.9637	2nd Quintile
5	38.94886	-76.9958	2nd Quintile
5	38.93779	-76.9697	2nd Quintile
5	38.91295	-77.0142	2nd Quintile
5	38.91703	-77.0095	2nd Quintile
5	38.95105	-76.9868	2nd Quintile
5	38.9126	-77.0034	2nd Quintile
5	38.91262	-77.016	2nd Quintile
5	38.91262	-77.0077	2nd Quintile
5	38.93487	-76.9842	1st Quintile
5	38.93098	-76.9828	1st Quintile
5	38.92651	-76.9652	1st Quintile
5	38.9034	-76.9762	1st Quintile
5	38.93832	-76.9766	1st Quintile
5	38.91261	-77.0104	1st Quintile
5	38.94071	-76.9934	1st Quintile
5	38.92193	-77.0035	1st Quintile
5	38.917	-77.0068	1st Quintile
5	38.9431	-76.9773	1st Quintile
5	38.9051	-76.982	1st Quintile
5	38.92727	-76.9801	1st Quintile
5	38.93405	-76.9701	1st Quintile
5	38.94122	-76.9903	1st Quintile
5	38.92749	-76.9633	1st Quintile
5	38.91264	-77.0086	1st Quintile
5	38.93094	-76.9721	1st Quintile
5	38.91628	-77.0089	1st Quintile
5	38.91271	-77.0066	1st Quintile
5	38.91702	-77.0049	1st Quintile
5	38.929	-76.9808	1st Quintile
5	38.91187	-77.0079	1st Quintile
5	38.93978	-76.9742	1st Quintile
5	38.91922	-76.98	1st Quintile
5	38.93057	-76.9628	1st Quintile

5	38.9156	-77.001	1st Quintile
5	38.921	-76.9878	1st Quintile
5	38.92994	-76.9825	1st Quintile
5	38.93622	-76.9711	1st Quintile
5	38.9421	-76.9773	1st Quintile
5	38.95562	-77.0049	1st Quintile
5	38.91919	-76.9812	1st Quintile
5	38.94289	-76.9792	1st Quintile
5	38.95164	-76.9891	1st Quintile
5	38.92105	-77.002	1st Quintile
5	38.93365	-76.9865	1st Quintile
5	38.93257	-76.9811	1st Quintile
5	38.93283	-76.9859	1st Quintile
5	38.9334	-76.9927	1st Quintile
5	38.91198	-76.9848	1st Quintile
5	38.93076	-76.9679	1st Quintile
5	38.94642	-76.9889	1st Quintile
5	38.91627	-77.0133	1st Quintile
5	38.93606	-76.9864	1st Quintile
5	38.90303	-76.9825	1st Quintile
5	38.91755	-77.002	1st Quintile
5	38.93234	-76.9983	1st Quintile
5	38.93452	-76.9912	1st Quintile
5	38.93215	-76.9773	1st Quintile
5	38.92354	-77.0035	1st Quintile
5	38.94301	-76.9873	1st Quintile
5	38.91931	-77.002	1st Quintile
5	38.94942	-76.9906	1st Quintile
5	38.93901	-76.9903	1st Quintile
5	38.93512	-76.9701	1st Quintile
5	38.93314	-76.9748	1st Quintile
5	38.92906	-76.9772	1st Quintile
5	38.94111	-76.9819	1st Quintile
5	38.93645	-76.9815	1st Quintile
5	38.93771	-76.9905	1st Quintile
5	38.93283	-76.9644	1st Quintile
5	38.92926	-76.9644	1st Quintile
5	38.9002	-76.9838	1st Quintile
5	38.90528	-76.9916	1st Quintile
5	38.92768	-76.9962	1st Quintile
5	38.95386	-76.9873	1st Quintile
5	38.94271	-76.9857	1st Quintile
5	38.92045	-76.9637	1st Quintile
5	38.94505	-77.0074	1st Quintile
5	38.95549	-76.9961	1st Quintile
5	38.94288	-77.0037	1st Quintile
5	38.93134	-76.9811	1st Quintile

5	38.93727	-76.9896	1st Quintile
5	38.93138	-76.9953	1st Quintile
5	38.93289	-76.9677	1st Quintile
5	38.9432	-76.9842	1st Quintile
5	38.90781	-76.9887	1st Quintile
5	38.95057	-76.9868	1st Quintile
5	38.93157	-76.9657	1st Quintile
5	38.92072	-76.9655	1st Quintile
5	38.93448	-76.9923	1st Quintile
5	38.90009	-76.9791	1st Quintile
5	38.91798	-77.0051	1st Quintile
5	38.95034	-76.9917	1st Quintile
5	38.92944	-77.018	1st Quintile
5	38.93287	-76.9667	1st Quintile
5	38.90143	-76.9788	1st Quintile
5	38.93099	-76.9673	1st Quintile
5	38.94723	-76.9898	1st Quintile
5	38.95514	-76.9916	1st Quintile
5	38.95721	-76.9942	1st Quintile
5	38.94896	-76.997	1st Quintile
5	38.93113	-76.9669	1st Quintile
5	38.90178	-76.9873	1st Quintile
5	38.93239	-76.9973	1st Quintile
5	38.93411	-76.9793	1st Quintile
5	38.94303	-77.003	1st Quintile
5	38.95192	-76.9968	1st Quintile
5	38.90373	-76.9773	1st Quintile
5	38.92102	-76.9893	1st Quintile
5	38.92013	-76.9701	1st Quintile
5	38.91122	-76.9859	1st Quintile
5	38.91332	-76.9861	1st Quintile
5	38.95171	-76.9917	1st Quintile
5	38.90478	-76.9852	1st Quintile
5	38.93727	-76.9891	1st Quintile
5	38.94884	-76.9966	1st Quintile
5	38.90621	-76.9805	1st Quintile
5	38.91325	-76.9839	1st Quintile
5	38.93411	-76.9789	1st Quintile
5	38.93411	-76.9753	1st Quintile
5	38.9329	-76.9671	1st Quintile
5	38.9428	-76.9883	1st Quintile
5	38.93264	-76.9729	1st Quintile
5	38.91969	-76.9704	1st Quintile
5	38.93014	-76.9615	1st Quintile
5	38.92898	-76.9682	1st Quintile
5	38.94708	-76.9827	1st Quintile
5	38.90917	-76.9863	1st Quintile

5	38.94634	-76.9779	1st Quintile
5	38.92937	-76.9654	1st Quintile
5	38.93588	-76.9931	1st Quintile
5	38.92031	-76.9868	1st Quintile
5	38.90683	-76.9873	1st Quintile
5	38.91248	-76.9905	1st Quintile
5	38.92789	-76.9637	1st Quintile
5	38.92401	-76.9722	1st Quintile
5	38.92887	-76.9649	1st Quintile
5	38.92108	-76.9888	1st Quintile
5	38.92695	-76.9631	1st Quintile
5	38.94215	-77.0058	1st Quintile
5	38.94271	-77.0044	1st Quintile
6	38.89094	-76.9821	5th Quintile
6	38.88896	-76.9926	5th Quintile
6	38.88575	-77.0003	5th Quintile
6	38.88316	-77.0021	5th Quintile
6	38.90727	-77.0156	5th Quintile
6	38.88786	-77.0006	5th Quintile
6	38.87933	-76.9926	5th Quintile
6	38.89359	-76.994	5th Quintile
6	38.88412	-76.9854	5th Quintile
6	38.90374	-76.9944	5th Quintile
6	38.88279	-76.9938	5th Quintile
6	38.8814	-76.9938	5th Quintile
6	38.88967	-77.002	5th Quintile
6	38.90133	-76.9883	5th Quintile
6	38.88211	-77.0021	5th Quintile
6	38.90341	-77.0021	5th Quintile
6	38.88331	-76.9916	5th Quintile
6	38.88412	-76.9905	5th Quintile
6	38.88609	-76.9902	5th Quintile
6	38.9042	-76.9962	5th Quintile
6	38.89504	-77.002	5th Quintile
6	38.88347	-76.9927	5th Quintile
6	38.90376	-76.9982	5th Quintile
6	38.90302	-77.0019	5th Quintile
6	38.90566	-77.0028	5th Quintile
6	38.89665	-76.9938	5th Quintile
6	38.90565	-77.0021	5th Quintile
6	38.9053	-76.9984	5th Quintile
6	38.88605	-76.9916	5th Quintile
6	38.91115	-77.0171	5th Quintile
6	38.89614	-77.0034	5th Quintile
6	38.8904	-76.9914	5th Quintile
6	38.90726	-77.0198	5th Quintile
6	38.90565	-77	5th Quintile

6	38.90013	-76.9841	5th Quintile
6	38.88061	-76.9856	5th Quintile
6	38.8831	-77.0006	5th Quintile
6	38.89044	-76.9938	5th Quintile
6	38.88771	-76.9962	5th Quintile
6	38.89092	-76.9811	5th Quintile
6	38.89371	-76.9915	5th Quintile
6	38.88842	-76.9938	5th Quintile
6	38.88224	-76.9927	5th Quintile
6	38.89341	-77.0021	5th Quintile
6	38.89512	-77.0035	5th Quintile
6	38.90133	-76.9921	5th Quintile
6	38.88545	-76.979	5th Quintile
6	38.89612	-77.0026	5th Quintile
6	38.88892	-76.9985	5th Quintile
6	38.89879	-76.9915	5th Quintile
6	38.91171	-77.0229	5th Quintile
6	38.89482	-76.9903	5th Quintile
6	38.89616	-76.9962	5th Quintile
6	38.90091	-76.9883	5th Quintile
6	38.9059	-76.9995	5th Quintile
6	38.89094	-77	5th Quintile
6	38.88411	-76.9867	5th Quintile
6	38.88253	-76.9927	5th Quintile
6	38.90379	-76.9962	5th Quintile
6	38.88412	-76.9857	5th Quintile
6	38.90375	-76.9948	5th Quintile
6	38.88945	-76.9995	5th Quintile
6	38.88043	-76.9859	5th Quintile
6	38.89803	-76.9837	5th Quintile
6	38.88545	-76.9985	5th Quintile
6	38.90966	-77.0195	5th Quintile
6	38.88834	-76.9962	5th Quintile
6	38.89168	-76.9856	5th Quintile
6	38.9038	-77.0021	5th Quintile
6	38.88244	-77.0021	5th Quintile
6	38.88428	-77.0017	5th Quintile
6	38.89482	-77.0035	5th Quintile
6	38.90495	-76.9995	5th Quintile
6	38.88746	-76.9985	5th Quintile
6	38.88179	-76.9938	5th Quintile
6	38.88462	-76.9883	5th Quintile
6	38.90327	-76.9916	5th Quintile
6	38.90859	-77.0161	5th Quintile
6	38.88042	-76.9995	5th Quintile
6	38.88412	-76.9927	5th Quintile
6	38.88772	-76.9995	5th Quintile

6	38.88528	-76.9927	5th Quintile
6	38.90297	-76.9985	5th Quintile
6	38.88607	-77.0035	5th Quintile
6	38.88682	-76.9901	5th Quintile
6	38.88431	-76.9883	5th Quintile
6	38.89543	-76.9915	5th Quintile
6	38.88408	-76.9951	5th Quintile
6	38.90376	-76.9939	5th Quintile
6	38.91114	-77.0232	5th Quintile
6	38.89042	-76.9927	5th Quintile
6	38.89094	-76.9996	5th Quintile
6	38.88879	-76.9995	5th Quintile
6	38.90481	-77.0021	5th Quintile
6	38.89549	-76.9962	5th Quintile
6	38.88709	-76.9835	5th Quintile
6	38.88161	-77.0021	5th Quintile
6	38.88844	-76.9926	5th Quintile
6	38.90234	-77.002	5th Quintile
6	38.90085	-76.9858	5th Quintile
6	38.89141	-76.9837	5th Quintile
6	38.90077	-76.989	5th Quintile
6	38.89737	-76.9915	5th Quintile
6	38.898	-76.9903	5th Quintile
6	38.89094	-76.9837	5th Quintile
6	38.89214	-76.9837	5th Quintile
6	38.89339	-76.9793	5th Quintile
6	38.90355	-76.9926	5th Quintile
6	38.9015	-76.9938	5th Quintile
6	38.88821	-76.9985	5th Quintile
6	38.90133	-76.9916	5th Quintile
6	38.88497	-76.9915	5th Quintile
6	38.90566	-76.9974	5th Quintile
6	38.88688	-76.9927	5th Quintile
6	38.88589	-77.0006	5th Quintile
6	38.88098	-76.9995	5th Quintile
6	38.90134	-77.002	5th Quintile
6	38.89732	-76.9963	5th Quintile
6	38.88495	-76.9927	5th Quintile
6	38.88965	-76.9938	5th Quintile
6	38.88381	-77.0021	5th Quintile
6	38.89598	-76.9773	5th Quintile
6	38.89614	-76.9917	5th Quintile
6	38.88428	-77.0021	5th Quintile
6	38.88135	-76.9902	5th Quintile
6	38.89094	-76.9989	5th Quintile
6	38.91014	-77.0165	4th Quintile
6	38.88008	-76.9962	4th Quintile

6	38.8837	-76.9915	4th Quintile
6	38.89838	-76.9903	4th Quintile
6	38.90265	-77.002	4th Quintile
6	38.89489	-76.9995	4th Quintile
6	38.89605	-76.9883	4th Quintile
6	38.89095	-77.0015	4th Quintile
6	38.89095	-77.0019	4th Quintile
6	38.89095	-76.9961	4th Quintile
6	38.89611	-77.0008	4th Quintile
6	38.89614	-76.9904	4th Quintile
6	38.88126	-76.9837	4th Quintile
6	38.87873	-76.9903	4th Quintile
6	38.88126	-77.0006	4th Quintile
6	38.8813	-76.9995	4th Quintile
6	38.90964	-77.0234	4th Quintile
6	38.88571	-76.9916	4th Quintile
6	38.9119	-77.0172	4th Quintile
6	38.88266	-77.0035	4th Quintile
6	38.90162	-76.9927	4th Quintile
6	38.89095	-76.9975	4th Quintile
6	38.90374	-76.9957	4th Quintile
6	38.88121	-76.9883	4th Quintile
6	38.88342	-77.0035	4th Quintile
6	38.90319	-76.9927	4th Quintile
6	38.91362	-77.0178	4th Quintile
6	38.87969	-76.9962	4th Quintile
6	38.88783	-76.9985	4th Quintile
6	38.88064	-76.9938	4th Quintile
6	38.88975	-76.9995	4th Quintile
6	38.89382	-76.9927	4th Quintile
6	38.89322	-77.0006	4th Quintile
6	38.90161	-76.9883	4th Quintile
6	38.88963	-76.9962	4th Quintile
6	38.90534	-76.9995	4th Quintile
6	38.9139	-77.0179	4th Quintile
6	38.88944	-76.9915	4th Quintile
6	38.88775	-76.9927	4th Quintile
6	38.8905	-76.9822	4th Quintile
6	38.88562	-77.0006	4th Quintile
6	38.88503	-77.0035	4th Quintile
6	38.8804	-76.9927	4th Quintile
6	38.88918	-76.9938	4th Quintile
6	38.88422	-77.0035	4th Quintile
6	38.90062	-76.9915	4th Quintile
6	38.88011	-76.9927	4th Quintile
6	38.88336	-76.979	4th Quintile
6	38.9105	-77.0167	4th Quintile

6	38.89892	-76.9948	4th Quintile
6	38.89075	-76.9883	4th Quintile
6	38.88283	-76.9902	4th Quintile
6	38.88227	-77.0035	4th Quintile
6	38.91141	-77.0229	4th Quintile
6	38.88199	-77.0034	4th Quintile
6	38.89893	-76.9995	4th Quintile
6	38.88644	-76.9915	4th Quintile
6	38.90519	-77.002	4th Quintile
6	38.90449	-76.9995	4th Quintile
6	38.88923	-77.002	4th Quintile
6	38.88087	-77.002	4th Quintile
6	38.89741	-76.9995	4th Quintile
6	38.89309	-77.0035	4th Quintile
6	38.90253	-76.9998	4th Quintile
6	38.89095	-76.9949	4th Quintile
6	38.88138	-76.9962	4th Quintile
6	38.88202	-76.9838	4th Quintile
6	38.88411	-76.9919	4th Quintile
6	38.89114	-76.9938	4th Quintile
6	38.90405	-76.995	4th Quintile
6	38.88724	-77.0035	4th Quintile
6	38.8948	-76.9946	4th Quintile
6	38.8878	-76.9938	4th Quintile
6	38.89237	-76.9938	4th Quintile
6	38.89809	-76.9995	4th Quintile
6	38.89095	-77.0005	4th Quintile
6	38.91281	-77.0175	4th Quintile
6	38.89621	-76.9855	4th Quintile
6	38.8832	-76.9822	4th Quintile
6	38.88023	-76.9854	4th Quintile
6	38.89926	-76.9794	4th Quintile
6	38.87841	-76.987	4th Quintile
6	38.88537	-76.9876	4th Quintile
6	38.88661	-76.979	4th Quintile
6	38.89358	-76.9923	4th Quintile
6	38.90482	-76.9951	4th Quintile
6	38.89095	-76.9953	4th Quintile
6	38.89999	-76.9903	4th Quintile
6	38.89186	-76.9995	4th Quintile
6	38.91189	-77.0186	4th Quintile
6	38.89796	-76.9944	4th Quintile
6	38.88646	-77.0004	4th Quintile
6	38.9025	-76.9916	4th Quintile
6	38.90195	-77.0021	4th Quintile
6	38.89314	-76.9822	4th Quintile
6	38.89339	-76.9806	4th Quintile

6	38.89599	-76.995	4th Quintile
6	38.89094	-76.9985	4th Quintile
6	38.90093	-76.9915	4th Quintile
6	38.89192	-76.9984	4th Quintile
6	38.8778	-76.9883	4th Quintile
6	38.90394	-76.9932	4th Quintile
6	38.89208	-76.9884	4th Quintile
6	38.90061	-76.9995	4th Quintile
6	38.90912	-77.0162	4th Quintile
6	38.88202	-76.9902	4th Quintile
6	38.88253	-76.9916	4th Quintile
6	38.88037	-76.9915	4th Quintile
6	38.89893	-76.9959	4th Quintile
6	38.90226	-76.9891	4th Quintile
6	38.88675	-76.9985	4th Quintile
6	38.88286	-76.9837	4th Quintile
6	38.89592	-76.9836	4th Quintile
6	38.87476	-77.0107	4th Quintile
6	38.91484	-77.0189	4th Quintile
6	38.88027	-76.995	4th Quintile
6	38.91004	-77.026	4th Quintile
6	38.88374	-77.0035	4th Quintile
6	38.89861	-76.9995	4th Quintile
6	38.90164	-76.9876	4th Quintile
6	38.91078	-77.0261	4th Quintile
6	38.88594	-76.979	4th Quintile
6	38.88753	-76.9837	4th Quintile
6	38.8996	-76.9903	4th Quintile
6	38.90064	-76.9855	4th Quintile
6	38.88933	-76.9985	4th Quintile
6	38.89096	-76.9965	4th Quintile
6	38.88608	-77.0009	4th Quintile
6	38.88645	-76.9927	4th Quintile
6	38.88868	-76.9838	4th Quintile
6	38.90131	-76.9869	4th Quintile
6	38.88916	-76.9962	4th Quintile
6	38.89376	-76.9938	4th Quintile
6	38.89336	-77.0035	4th Quintile
6	38.88136	-76.995	4th Quintile
6	38.88173	-76.9927	4th Quintile
6	38.88858	-76.9808	4th Quintile
6	38.89667	-76.981	4th Quintile
6	38.88013	-76.9984	4th Quintile
6	38.87841	-76.9849	4th Quintile
6	38.88384	-76.979	4th Quintile
6	38.89893	-76.9969	4th Quintile
6	38.88145	-76.9927	4th Quintile

6	38.91217	-77.0222	3rd Quintile
6	38.90565	-77.0199	3rd Quintile
6	38.88125	-76.9851	3rd Quintile
6	38.90191	-76.9995	3rd Quintile
6	38.89317	-76.9938	3rd Quintile
6	38.88347	-76.9962	3rd Quintile
6	38.90494	-76.9982	3rd Quintile
6	38.88812	-76.9945	3rd Quintile
6	38.88965	-76.9985	3rd Quintile
6	38.87782	-77.0006	3rd Quintile
6	38.91356	-77.0189	3rd Quintile
6	38.88605	-76.9949	3rd Quintile
6	38.90253	-76.9969	3rd Quintile
6	38.88447	-76.9926	3rd Quintile
6	38.88598	-76.9927	3rd Quintile
6	38.88277	-77.0006	3rd Quintile
6	38.91116	-77.0175	3rd Quintile
6	38.90544	-77.0031	3rd Quintile
6	38.8835	-76.9822	3rd Quintile
6	38.90529	-76.9962	3rd Quintile
6	38.88326	-77.0042	3rd Quintile
6	38.89563	-76.9938	3rd Quintile
6	38.89613	-76.9849	3rd Quintile
6	38.87845	-77.0021	3rd Quintile
6	38.89096	-76.997	3rd Quintile
6	38.88326	-77.005	3rd Quintile
6	38.88782	-76.9902	3rd Quintile
6	38.88191	-76.9897	3rd Quintile
6	38.87859	-76.9883	3rd Quintile
6	38.88682	-76.9893	3rd Quintile
6	38.87957	-76.984	3rd Quintile
6	38.89488	-76.9837	3rd Quintile
6	38.89425	-76.9985	3rd Quintile
6	38.88762	-76.9855	3rd Quintile
6	38.89792	-76.995	3rd Quintile
6	38.90501	-76.9962	3rd Quintile
6	38.88869	-77.0006	3rd Quintile
6	38.90117	-76.9865	3rd Quintile
6	38.88745	-76.9926	3rd Quintile
6	38.8948	-76.9938	3rd Quintile
6	38.88682	-76.9886	3rd Quintile
6	38.90374	-76.9994	3rd Quintile
6	38.88404	-76.9985	3rd Quintile
6	38.89145	-76.9927	3rd Quintile
6	38.9097	-77.0229	3rd Quintile
6	38.87755	-76.988	3rd Quintile
6	38.89363	-76.9903	3rd Quintile

6	38.89549	-77.0034	3rd Quintile
6	38.89729	-76.9837	3rd Quintile
6	38.89124	-76.9915	3rd Quintile
6	38.90254	-76.9988	3rd Quintile
6	38.90283	-76.9995	3rd Quintile
6	38.89611	-77.0022	3rd Quintile
6	38.90139	-76.9995	3rd Quintile
6	38.90251	-76.9922	3rd Quintile
6	38.88605	-76.9897	3rd Quintile
6	38.88047	-76.9962	3rd Quintile
6	38.90725	-77.0165	3rd Quintile
6	38.91114	-77.0237	3rd Quintile
6	38.88098	-76.9938	3rd Quintile
6	38.88281	-76.9927	3rd Quintile
6	38.90628	-76.9995	3rd Quintile
6	38.88694	-77.0035	3rd Quintile
6	38.88815	-76.9995	3rd Quintile
6	38.88604	-76.9822	3rd Quintile
6	38.90564	-76.9985	3rd Quintile
6	38.89505	-76.9962	3rd Quintile
6	38.9141	-77.0201	3rd Quintile
6	38.91086	-77.023	3rd Quintile
6	38.89009	-76.9995	3rd Quintile
6	38.89352	-76.9927	3rd Quintile
6	38.88868	-76.9944	3rd Quintile
6	38.88428	-76.9963	3rd Quintile
6	38.88884	-76.9962	3rd Quintile
6	38.89854	-76.9944	3rd Quintile
6	38.89588	-76.9915	3rd Quintile
6	38.8979	-76.9915	3rd Quintile
6	38.90724	-77.0149	3rd Quintile
6	38.90442	-76.995	3rd Quintile
6	38.88274	-76.9962	3rd Quintile
6	38.8794	-76.9883	3rd Quintile
6	38.90566	-76.9978	3rd Quintile
6	38.8932	-76.9962	3rd Quintile
6	38.88612	-76.9808	3rd Quintile
6	38.88127	-76.9823	3rd Quintile
6	38.90115	-76.9938	3rd Quintile
6	38.90133	-76.989	3rd Quintile
6	38.91157	-77.017	3rd Quintile
6	38.88412	-76.9811	3rd Quintile
6	38.88637	-76.9938	3rd Quintile
6	38.89359	-76.9973	3rd Quintile
6	38.89478	-76.9832	3rd Quintile
6	38.88416	-76.979	3rd Quintile
6	38.90138	-76.9962	3rd Quintile

6	38.91115	-77.019	3rd Quintile
6	38.87932	-77.002	3rd Quintile
6	38.90253	-76.9982	3rd Quintile
6	38.87938	-76.9903	3rd Quintile
6	38.90003	-76.9835	3rd Quintile
6	38.89416	-76.9915	3rd Quintile
6	38.88685	-76.9938	3rd Quintile
6	38.90662	-76.9994	3rd Quintile
6	38.89094	-76.9843	3rd Quintile
6	38.89291	-76.9915	3rd Quintile
6	38.89545	-76.9995	3rd Quintile
6	38.90564	-77.0009	3rd Quintile
6	38.87841	-76.9855	3rd Quintile
6	38.89429	-76.995	3rd Quintile
6	38.90594	-76.9985	3rd Quintile
6	38.90134	-76.9943	3rd Quintile
6	38.89822	-76.9915	3rd Quintile
6	38.89913	-76.9903	3rd Quintile
6	38.88126	-76.9916	3rd Quintile
6	38.88537	-76.9846	3rd Quintile
6	38.88085	-76.9962	3rd Quintile
6	38.90375	-76.9987	3rd Quintile
6	38.88849	-76.9915	3rd Quintile
6	38.88274	-76.9969	3rd Quintile
6	38.9016	-76.9902	3rd Quintile
6	38.88925	-76.9837	3rd Quintile
6	38.89124	-76.9822	3rd Quintile
6	38.88409	-76.9836	3rd Quintile
6	38.87974	-76.9927	2nd Quintile
6	38.89547	-76.998	2nd Quintile
6	38.89112	-76.9883	2nd Quintile
6	38.88075	-76.995	2nd Quintile
6	38.8876	-76.9866	2nd Quintile
6	38.88651	-76.9822	2nd Quintile
6	38.88515	-76.979	2nd Quintile
6	38.88555	-76.9998	2nd Quintile
6	38.89527	-76.9938	2nd Quintile
6	38.8898	-76.9859	2nd Quintile
6	38.88544	-76.9915	2nd Quintile
6	38.89738	-76.9951	2nd Quintile
6	38.90469	-76.9962	2nd Quintile
6	38.89658	-76.9837	2nd Quintile
6	38.88686	-76.9915	2nd Quintile
6	38.90136	-76.995	2nd Quintile
6	38.89362	-76.9822	2nd Quintile
6	38.9025	-76.9897	2nd Quintile
6	38.89869	-76.9836	2nd Quintile

6	38.89839	-76.9855	2nd Quintile
6	38.88911	-76.9883	2nd Quintile
6	38.9078	-77.02	2nd Quintile
6	38.90133	-76.9902	2nd Quintile
6	38.90375	-76.9969	2nd Quintile
6	38.89607	-76.9938	2nd Quintile
6	38.91429	-77.0189	2nd Quintile
6	38.8803	-76.9811	2nd Quintile
6	38.89614	-76.9925	2nd Quintile
6	38.90654	-77.0137	2nd Quintile
6	38.89359	-76.9963	2nd Quintile
6	38.89887	-76.9938	2nd Quintile
6	38.89358	-76.9959	2nd Quintile
6	38.89613	-76.9912	2nd Quintile
6	38.90252	-76.9941	2nd Quintile
6	38.90448	-77.0199	2nd Quintile
6	38.89954	-76.9883	2nd Quintile
6	38.90185	-76.9938	2nd Quintile
6	38.89973	-76.9915	2nd Quintile
6	38.88566	-76.9987	2nd Quintile
6	38.90378	-76.9935	2nd Quintile
6	38.87843	-76.9995	2nd Quintile
6	38.88617	-76.9872	2nd Quintile
6	38.91397	-77.024	2nd Quintile
6	38.89723	-76.9841	2nd Quintile
6	38.88018	-76.985	2nd Quintile
6	38.8791	-76.9903	2nd Quintile
6	38.88494	-76.9938	2nd Quintile
6	38.88536	-76.9857	2nd Quintile
6	38.8965	-76.9902	2nd Quintile
6	38.89274	-76.9903	2nd Quintile
6	38.8845	-76.9903	2nd Quintile
6	38.89481	-76.9941	2nd Quintile
6	38.89592	-76.9822	2nd Quintile
6	38.88869	-76.9844	2nd Quintile
6	38.88411	-76.9786	2nd Quintile
6	38.89372	-76.9837	2nd Quintile
6	38.89093	-76.9849	2nd Quintile
6	38.88411	-76.9839	2nd Quintile
6	38.8925	-77.0006	2nd Quintile
6	38.88107	-76.9902	2nd Quintile
6	38.89628	-76.9837	2nd Quintile
6	38.89816	-76.9799	2nd Quintile
6	38.88275	-76.9844	2nd Quintile
6	38.89893	-77.0004	2nd Quintile
6	38.8761	-77.0107	2nd Quintile
6	38.88645	-76.9985	2nd Quintile

6	38.88655	-76.9996	2nd Quintile
6	38.88911	-76.9903	2nd Quintile
6	38.88412	-76.9875	2nd Quintile
6	38.88127	-76.9944	2nd Quintile
6	38.89892	-76.9952	2nd Quintile
6	38.90283	-76.9927	2nd Quintile
6	38.88127	-76.9815	2nd Quintile
6	38.89092	-76.9927	2nd Quintile
6	38.89201	-76.9969	2nd Quintile
6	38.88867	-76.9935	2nd Quintile
6	38.89629	-76.9995	2nd Quintile
6	38.88695	-76.9832	2nd Quintile
6	38.87436	-77.0122	2nd Quintile
6	38.88791	-76.9822	2nd Quintile
6	38.91297	-77.02	2nd Quintile
6	38.89358	-76.9947	2nd Quintile
6	38.89842	-76.9938	2nd Quintile
6	38.89082	-76.9938	2nd Quintile
6	38.89892	-76.9943	2nd Quintile
6	38.8852	-76.9883	2nd Quintile
6	38.87873	-76.9822	2nd Quintile
6	38.8793	-76.9933	2nd Quintile
6	38.88869	-76.9988	2nd Quintile
6	38.90648	-77.0141	2nd Quintile
6	38.90809	-77.0158	2nd Quintile
6	38.88537	-76.9837	2nd Quintile
6	38.89682	-76.9962	2nd Quintile
6	38.87841	-76.9836	2nd Quintile
6	38.90505	-76.9956	2nd Quintile
6	38.90007	-76.9915	2nd Quintile
6	38.89016	-76.9915	2nd Quintile
6	38.88869	-76.9972	2nd Quintile
6	38.89479	-76.984	2nd Quintile
6	38.90218	-76.9995	2nd Quintile
6	38.8779	-76.9837	2nd Quintile
6	38.8813	-77.0016	2nd Quintile
6	38.88538	-76.9865	2nd Quintile
6	38.90612	-76.9981	2nd Quintile
6	38.91114	-77.0186	2nd Quintile
6	38.89358	-76.9931	2nd Quintile
6	38.89019	-76.9985	2nd Quintile
6	38.89211	-76.9799	2nd Quintile
6	38.87841	-76.9865	2nd Quintile
6	38.8862	-76.9836	1st Quintile
6	38.89765	-76.9821	1st Quintile
6	38.89275	-76.983	1st Quintile
6	38.88834	-76.9836	1st Quintile

6	38.89072	-76.9924	1st Quintile
6	38.87842	-76.988	1st Quintile
6	38.88604	-76.9938	1st Quintile
6	38.89733	-76.9986	1st Quintile
6	38.88904	-76.9922	1st Quintile
6	38.90032	-76.9883	1st Quintile
6	38.8802	-76.9862	1st Quintile
6	38.88971	-76.9882	1st Quintile
6	38.90038	-76.9938	1st Quintile
6	38.89098	-76.9872	1st Quintile
6	38.88735	-76.9949	1st Quintile
6	38.88405	-76.9822	1st Quintile
6	38.89957	-76.9899	1st Quintile
6	38.88274	-76.9979	1st Quintile
6	38.89547	-76.9949	1st Quintile
6	38.90347	-76.9938	1st Quintile
6	38.88868	-76.9832	1st Quintile
6	38.89422	-76.9995	1st Quintile
6	38.88366	-76.995	1st Quintile
6	38.87841	-77.0012	1st Quintile
6	38.89985	-76.9883	1st Quintile
6	38.88613	-76.9985	1st Quintile
6	38.89547	-76.9825	1st Quintile
6	38.87811	-76.9883	1st Quintile
6	38.89821	-77.0006	1st Quintile
6	38.89359	-76.9968	1st Quintile
6	38.89277	-76.9892	1st Quintile
6	38.88981	-76.9806	1st Quintile
6	38.87756	-77.0012	1st Quintile
6	38.88715	-77.002	1st Quintile
6	38.89869	-76.9828	1st Quintile
6	38.88547	-76.9883	1st Quintile
6	38.87641	-77.0115	1st Quintile
6	38.88128	-76.9828	1st Quintile
6	38.90252	-76.9909	1st Quintile
6	38.88569	-76.9903	1st Quintile
6	38.90031	-76.9855	1st Quintile
6	38.892	-76.9977	1st Quintile
6	38.90188	-76.9882	1st Quintile
6	38.90023	-76.9925	1st Quintile
6	38.89452	-77.002	1st Quintile
6	38.8876	-76.9975	1st Quintile
6	38.89548	-76.9834	1st Quintile
6	38.89487	-76.9773	1st Quintile
6	38.87966	-77.0006	1st Quintile
6	38.8973	-76.9855	1st Quintile
6	38.89734	-76.997	1st Quintile

6	38.90252	-76.9936	1st Quintile
6	38.91409	-77.0261	1st Quintile
6	38.89945	-77.0035	1st Quintile
7	38.90639	-76.9415	5th Quintile
7	38.89007	-76.9329	5th Quintile
7	38.89177	-76.926	5th Quintile
7	38.90491	-76.937	5th Quintile
7	38.86474	-76.9471	5th Quintile
7	38.912	-76.9367	5th Quintile
7	38.90424	-76.9388	5th Quintile
7	38.90549	-76.9371	5th Quintile
7	38.89724	-76.9261	5th Quintile
7	38.90483	-76.9461	5th Quintile
7	38.86468	-76.9457	5th Quintile
7	38.90723	-76.9413	5th Quintile
7	38.89648	-76.9273	5th Quintile
7	38.90597	-76.9327	5th Quintile
7	38.90913	-76.9327	5th Quintile
7	38.89025	-76.9602	5th Quintile
7	38.86952	-76.9426	5th Quintile
7	38.89716	-76.9192	5th Quintile
7	38.89279	-76.9291	5th Quintile
7	38.8984	-76.9425	5th Quintile
7	38.87756	-76.9647	5th Quintile
7	38.91007	-76.9376	5th Quintile
7	38.91266	-76.9394	5th Quintile
7	38.8955	-76.9178	5th Quintile
7	38.88458	-76.9575	5th Quintile
7	38.90602	-76.9286	5th Quintile
7	38.89198	-76.9349	5th Quintile
7	38.89659	-76.9269	5th Quintile
7	38.89661	-76.9281	5th Quintile
7	38.90593	-76.9419	5th Quintile
7	38.90465	-76.9454	5th Quintile
7	38.86743	-76.9426	5th Quintile
7	38.90402	-76.9455	5th Quintile
7	38.9046	-76.9458	5th Quintile
7	38.90909	-76.9354	5th Quintile
7	38.90722	-76.9402	5th Quintile
7	38.90371	-76.945	5th Quintile
7	38.88504	-76.9575	5th Quintile
7	38.90665	-76.9439	5th Quintile
7	38.89543	-76.9575	5th Quintile
7	38.91042	-76.9387	5th Quintile
7	38.89369	-76.93	5th Quintile
7	38.90706	-76.9431	5th Quintile
7	38.90928	-76.9357	5th Quintile

7	38.90733	-76.9428	5th Quintile
7	38.89872	-76.9486	5th Quintile
7	38.90562	-76.9422	5th Quintile
7	38.90808	-76.9425	5th Quintile
7	38.91117	-76.9328	5th Quintile
7	38.90365	-76.9338	5th Quintile
7	38.90463	-76.9417	5th Quintile
7	38.91107	-76.9407	5th Quintile
7	38.90637	-76.9427	5th Quintile
7	38.90466	-76.944	5th Quintile
7	38.90563	-76.9443	5th Quintile
7	38.90607	-76.928	5th Quintile
7	38.90562	-76.9413	5th Quintile
7	38.9117	-76.9362	5th Quintile
7	38.90944	-76.935	5th Quintile
7	38.90865	-76.9422	5th Quintile
7	38.91146	-76.9357	5th Quintile
7	38.90563	-76.9426	5th Quintile
7	38.9056	-76.9407	5th Quintile
7	38.89201	-76.9581	5th Quintile
7	38.89678	-76.9379	5th Quintile
7	38.89148	-76.9349	5th Quintile
7	38.90638	-76.9412	5th Quintile
7	38.90857	-76.9417	5th Quintile
7	38.89051	-76.9178	5th Quintile
7	38.90563	-76.9434	5th Quintile
7	38.90374	-76.9435	5th Quintile
7	38.90725	-76.9391	5th Quintile
7	38.90703	-76.9419	5th Quintile
7	38.90416	-76.9434	5th Quintile
7	38.90469	-76.9434	5th Quintile
7	38.8997	-76.9308	5th Quintile
7	38.89887	-76.9317	5th Quintile
7	38.89368	-76.9272	5th Quintile
7	38.90723	-76.9422	5th Quintile
7	38.89415	-76.921	5th Quintile
7	38.90702	-76.9317	5th Quintile
7	38.9015	-76.9389	5th Quintile
7	38.90374	-76.9426	4th Quintile
7	38.9078	-76.9344	4th Quintile
7	38.90994	-76.9371	4th Quintile
7	38.89318	-76.929	4th Quintile
7	38.8645	-76.9473	4th Quintile
7	38.89752	-76.9397	4th Quintile
7	38.89838	-76.9419	4th Quintile
7	38.89262	-76.9178	4th Quintile
7	38.90438	-76.9346	4th Quintile

7	38.89666	-76.915	4th Quintile
7	38.89201	-76.9585	4th Quintile
7	38.88498	-76.9284	4th Quintile
7	38.89513	-76.9251	4th Quintile
7	38.89161	-76.9602	4th Quintile
7	38.90256	-76.9356	4th Quintile
7	38.90388	-76.9235	4th Quintile
7	38.86446	-76.9545	4th Quintile
7	38.90067	-76.935	4th Quintile
7	38.89753	-76.9425	4th Quintile
7	38.8919	-76.9354	4th Quintile
7	38.89348	-76.934	4th Quintile
7	38.87595	-76.9349	4th Quintile
7	38.89067	-76.9526	4th Quintile
7	38.90608	-76.9352	4th Quintile
7	38.90334	-76.9433	4th Quintile
7	38.91184	-76.9388	4th Quintile
7	38.89752	-76.9406	4th Quintile
7	38.89755	-76.9699	4th Quintile
7	38.90132	-76.9229	4th Quintile
7	38.9032	-76.9377	4th Quintile
7	38.89358	-76.9566	4th Quintile
7	38.88573	-76.944	4th Quintile
7	38.86801	-76.9658	4th Quintile
7	38.87624	-76.935	4th Quintile
7	38.88821	-76.9267	4th Quintile
7	38.90215	-76.9366	4th Quintile
7	38.87482	-76.9349	4th Quintile
7	38.89404	-76.933	4th Quintile
7	38.89839	-76.9444	4th Quintile
7	38.90549	-76.9327	4th Quintile
7	38.9072	-76.9286	4th Quintile
7	38.8807	-76.9436	4th Quintile
7	38.87841	-76.9362	4th Quintile
7	38.9011	-76.9282	4th Quintile
7	38.89347	-76.9257	4th Quintile
7	38.89756	-76.9259	4th Quintile
7	38.89572	-76.932	4th Quintile
7	38.89754	-76.942	4th Quintile
7	38.89081	-76.9602	4th Quintile
7	38.89357	-76.9123	4th Quintile
7	38.89267	-76.9204	4th Quintile
7	38.89831	-76.9491	4th Quintile
7	38.8956	-76.9572	4th Quintile
7	38.8855	-76.9575	4th Quintile
7	38.88432	-76.9434	4th Quintile
7	38.90467	-76.9373	3rd Quintile

7	38.8935	-76.9575	3rd Quintile
7	38.8697	-76.9578	3rd Quintile
7	38.89927	-76.9219	3rd Quintile
7	38.88571	-76.9436	3rd Quintile
7	38.9015	-76.9372	3rd Quintile
7	38.91149	-76.9332	3rd Quintile
7	38.89354	-76.9253	3rd Quintile
7	38.88314	-76.9387	3rd Quintile
7	38.9003	-76.921	3rd Quintile
7	38.90491	-76.9275	3rd Quintile
7	38.89142	-76.9531	3rd Quintile
7	38.90347	-76.9317	3rd Quintile
7	38.89559	-76.9205	3rd Quintile
7	38.87944	-76.939	3rd Quintile
7	38.89627	-76.9304	3rd Quintile
7	38.87385	-76.9718	3rd Quintile
7	38.88344	-76.9429	3rd Quintile
7	38.889	-76.9321	3rd Quintile
7	38.89226	-76.9713	3rd Quintile
7	38.89907	-76.9423	3rd Quintile
7	38.90465	-76.9387	3rd Quintile
7	38.88441	-76.9572	3rd Quintile
7	38.90606	-76.9322	3rd Quintile
7	38.9015	-76.9382	3rd Quintile
7	38.89442	-76.9137	3rd Quintile
7	38.90209	-76.9376	3rd Quintile
7	38.8932	-76.9575	3rd Quintile
7	38.8653	-76.9458	3rd Quintile
7	38.90151	-76.9365	3rd Quintile
7	38.89848	-76.9178	3rd Quintile
7	38.89581	-76.9151	3rd Quintile
7	38.89752	-76.9401	3rd Quintile
7	38.88284	-76.9618	3rd Quintile
7	38.89783	-76.9496	3rd Quintile
7	38.9022	-76.9392	3rd Quintile
7	38.90154	-76.9356	3rd Quintile
7	38.89941	-76.9362	3rd Quintile
7	38.87724	-76.9355	3rd Quintile
7	38.89839	-76.9453	3rd Quintile
7	38.86312	-76.9615	3rd Quintile
7	38.90373	-76.9354	3rd Quintile
7	38.8888	-76.9542	3rd Quintile
7	38.89723	-76.9471	3rd Quintile
7	38.89531	-76.9549	3rd Quintile
7	38.89308	-76.9517	3rd Quintile
7	38.88285	-76.9603	2nd Quintile
7	38.90468	-76.9351	2nd Quintile

7	38.88576	-76.9186	2nd Quintile
7	38.88473	-76.9437	2nd Quintile
7	38.89911	-76.9244	2nd Quintile
7	38.90185	-76.9285	2nd Quintile
7	38.89112	-76.9349	2nd Quintile
7	38.88166	-76.9242	2nd Quintile
7	38.88285	-76.9592	2nd Quintile
7	38.88485	-76.9423	2nd Quintile
7	38.90937	-76.9324	2nd Quintile
7	38.88381	-76.9414	2nd Quintile
7	38.89975	-76.9346	2nd Quintile
7	38.89277	-76.9519	2nd Quintile
7	38.89974	-76.9391	2nd Quintile
7	38.90033	-76.9387	2nd Quintile
7	38.89078	-76.9513	2nd Quintile
7	38.89783	-76.9723	2nd Quintile
7	38.89519	-76.9363	2nd Quintile
7	38.90237	-76.9347	2nd Quintile
7	38.89731	-76.9358	2nd Quintile
7	38.89678	-76.9391	2nd Quintile
7	38.89291	-76.9143	2nd Quintile
7	38.8929	-76.9121	2nd Quintile
7	38.90434	-76.9354	2nd Quintile
7	38.905	-76.9263	2nd Quintile
7	38.86733	-76.9623	2nd Quintile
7	38.89425	-76.9252	2nd Quintile
7	38.87916	-76.9421	2nd Quintile
7	38.87374	-76.9715	2nd Quintile
7	38.87807	-76.936	2nd Quintile
7	38.90332	-76.939	2nd Quintile
7	38.89317	-76.9371	2nd Quintile
7	38.89729	-76.9219	2nd Quintile
7	38.90281	-76.9337	2nd Quintile
7	38.90141	-76.9234	2nd Quintile
7	38.89892	-76.9178	2nd Quintile
7	38.90608	-76.937	2nd Quintile
7	38.87868	-76.9424	2nd Quintile
7	38.89615	-76.9333	2nd Quintile
7	38.88348	-76.9264	2nd Quintile
7	38.86191	-76.9605	2nd Quintile
7	38.87716	-76.9636	2nd Quintile
7	38.86458	-76.9624	2nd Quintile
7	38.88643	-76.9235	2nd Quintile
7	38.90368	-76.9346	2nd Quintile
7	38.87696	-76.9398	2nd Quintile
7	38.89909	-76.9351	2nd Quintile
7	38.8934	-76.9444	2nd Quintile

7	38.8694	-76.953	2nd Quintile
7	38.90512	-76.9384	2nd Quintile
7	38.88581	-76.924	2nd Quintile
7	38.89482	-76.9269	2nd Quintile
7	38.88736	-76.9255	2nd Quintile
7	38.9003	-76.9285	2nd Quintile
7	38.89795	-76.9192	2nd Quintile
7	38.90154	-76.9376	2nd Quintile
7	38.89835	-76.923	2nd Quintile
7	38.89837	-76.9392	2nd Quintile
7	38.8959	-76.9205	2nd Quintile
7	38.89123	-76.919	2nd Quintile
7	38.89678	-76.9394	2nd Quintile
7	38.87486	-76.9681	2nd Quintile
7	38.89833	-76.9263	2nd Quintile
7	38.90179	-76.9347	2nd Quintile
7	38.89046	-76.9327	2nd Quintile
7	38.89395	-76.9219	2nd Quintile
7	38.90722	-76.9294	2nd Quintile
7	38.89306	-76.9361	2nd Quintile
7	38.86939	-76.9678	2nd Quintile
7	38.87405	-76.9722	2nd Quintile
7	38.8932	-76.9123	2nd Quintile
7	38.85882	-76.9602	1st Quintile
7	38.89838	-76.9413	1st Quintile
7	38.89998	-76.9307	1st Quintile
7	38.9036	-76.9297	1st Quintile
7	38.88728	-76.9233	1st Quintile
7	38.90151	-76.94	1st Quintile
7	38.89838	-76.9403	1st Quintile
7	38.86082	-76.9576	1st Quintile
7	38.89345	-76.9393	1st Quintile
7	38.87963	-76.9452	1st Quintile
7	38.86203	-76.9576	1st Quintile
7	38.90606	-76.9317	1st Quintile
7	38.86196	-76.9591	1st Quintile
7	38.86416	-76.9475	1st Quintile
7	38.89236	-76.9358	1st Quintile
7	38.89705	-76.9304	1st Quintile
7	38.89307	-76.9212	1st Quintile
7	38.87439	-76.9697	1st Quintile
7	38.86845	-76.942	1st Quintile
7	38.87042	-76.945	1st Quintile
7	38.87098	-76.9512	1st Quintile
7	38.89079	-76.9302	1st Quintile
7	38.89081	-76.9328	1st Quintile
7	38.90533	-76.9253	1st Quintile

7	38.88838	-76.9276	1st Quintile
7	38.89959	-76.9315	1st Quintile
7	38.89221	-76.9292	1st Quintile
7	38.89425	-76.9219	1st Quintile
7	38.89753	-76.9192	1st Quintile
7	38.86653	-76.9476	1st Quintile
7	38.89384	-76.9164	1st Quintile
7	38.8765	-76.9324	1st Quintile
7	38.89291	-76.9137	1st Quintile
7	38.89356	-76.9264	1st Quintile
7	38.89255	-76.9368	1st Quintile
7	38.89483	-76.9391	1st Quintile
7	38.89747	-76.9377	1st Quintile
7	38.86227	-76.9605	1st Quintile
7	38.89547	-76.9267	1st Quintile
7	38.86925	-76.9409	1st Quintile
7	38.89638	-76.915	1st Quintile
7	38.89651	-76.9265	1st Quintile
7	38.89735	-76.9759	1st Quintile
7	38.89356	-76.9289	1st Quintile
7	38.8941	-76.9295	1st Quintile
7	38.89598	-76.9164	1st Quintile
7	38.87463	-76.9647	1st Quintile
7	38.89716	-76.9167	1st Quintile
7	38.89614	-76.9321	1st Quintile
7	38.86911	-76.9416	1st Quintile
7	38.87868	-76.9382	1st Quintile
7	38.86867	-76.9678	1st Quintile
7	38.8603	-76.9575	1st Quintile
7	38.86281	-76.9592	1st Quintile
8	38.83989	-77.0058	5th Quintile
8	38.84493	-77.0081	5th Quintile
8	38.84759	-76.9989	5th Quintile
8	38.87324	-76.9739	5th Quintile
8	38.86427	-76.9812	5th Quintile
8	38.86428	-76.9869	5th Quintile
8	38.86694	-76.9839	5th Quintile
8	38.84116	-77.0058	5th Quintile
8	38.82613	-76.9974	5th Quintile
8	38.86029	-76.989	5th Quintile
8	38.86537	-76.9823	5th Quintile
8	38.82952	-77.0077	5th Quintile
8	38.86513	-76.9811	5th Quintile
8	38.87137	-76.9749	5th Quintile
8	38.87277	-76.9747	5th Quintile
8	38.8648	-76.9857	5th Quintile
8	38.84118	-76.99	5th Quintile

8	38.82398	-76.9981	5th Quintile
8	38.86449	-76.9824	5th Quintile
8	38.84088	-77.0052	5th Quintile
8	38.86949	-76.9725	5th Quintile
8	38.82364	-77.0117	5th Quintile
8	38.86475	-76.9799	4th Quintile
8	38.87197	-76.9738	4th Quintile
8	38.83037	-76.9934	4th Quintile
8	38.844	-76.9722	4th Quintile
8	38.83121	-77.0061	4th Quintile
8	38.86579	-76.9855	4th Quintile
8	38.86452	-76.9876	4th Quintile
8	38.84396	-77.0082	4th Quintile
8	38.82701	-77.0093	4th Quintile
8	38.84779	-76.9992	4th Quintile
8	38.86445	-76.9872	4th Quintile
8	38.82923	-77.0001	4th Quintile
8	38.86575	-76.9821	4th Quintile
8	38.87175	-76.9742	4th Quintile
8	38.86054	-76.986	4th Quintile
8	38.84079	-76.9911	4th Quintile
8	38.86723	-76.9703	4th Quintile
8	38.82919	-76.9951	4th Quintile
8	38.86506	-76.9807	4th Quintile
8	38.827	-77.0089	4th Quintile
8	38.83147	-76.9901	4th Quintile
8	38.827	-77.0113	4th Quintile
8	38.86824	-76.985	4th Quintile
8	38.86638	-76.9879	4th Quintile
8	38.86505	-76.9798	4th Quintile
8	38.86605	-76.982	4th Quintile
8	38.84403	-77.0015	4th Quintile
8	38.86385	-76.988	4th Quintile
8	38.86455	-76.9828	4th Quintile
8	38.86947	-76.9818	4th Quintile
8	38.85569	-76.9875	4th Quintile
8	38.86619	-76.9869	4th Quintile
8	38.86427	-76.9862	3rd Quintile
8	38.87027	-76.979	3rd Quintile
8	38.86503	-76.9855	3rd Quintile
8	38.8404	-76.9936	3rd Quintile
8	38.84575	-76.9797	3rd Quintile
8	38.86644	-76.9882	3rd Quintile
8	38.86728	-76.9829	3rd Quintile
8	38.87194	-76.9774	3rd Quintile
8	38.86382	-76.9838	3rd Quintile
8	38.86436	-76.9859	3rd Quintile

8	38.87218	-76.975	3rd Quintile
8	38.86884	-76.98	3rd Quintile
8	38.86413	-76.9879	3rd Quintile
8	38.86625	-76.9872	3rd Quintile
8	38.86465	-76.9835	3rd Quintile
8	38.84671	-76.9802	3rd Quintile
8	38.83946	-76.9948	3rd Quintile
8	38.8278	-77.0119	3rd Quintile
8	38.83095	-77.0009	3rd Quintile
8	38.86376	-76.9834	3rd Quintile
8	38.83935	-76.9955	2nd Quintile
8	38.86949	-76.9769	2nd Quintile
8	38.86382	-76.9889	2nd Quintile
8	38.85524	-76.9879	2nd Quintile
8	38.86377	-76.9827	2nd Quintile
8	38.86536	-76.9797	2nd Quintile
8	38.86575	-76.9767	2nd Quintile
8	38.8292	-76.9932	2nd Quintile
8	38.85015	-76.9743	2nd Quintile
8	38.82622	-76.9979	2nd Quintile
8	38.87077	-76.9738	2nd Quintile
8	38.86483	-76.9774	2nd Quintile
8	38.84014	-77.0062	2nd Quintile
8	38.86096	-76.9937	2nd Quintile
8	38.86654	-76.9838	2nd Quintile
8	38.86867	-76.9803	2nd Quintile
8	38.87063	-76.9799	2nd Quintile
8	38.84605	-76.9834	2nd Quintile
8	38.83009	-76.9959	2nd Quintile
8	38.82507	-76.9965	2nd Quintile
8	38.8229	-76.9992	2nd Quintile
8	38.87261	-76.9722	2nd Quintile
8	38.83126	-77.0065	2nd Quintile
8	38.87007	-76.9775	2nd Quintile
8	38.84401	-76.9906	2nd Quintile
8	38.82441	-77.0103	2nd Quintile
8	38.82791	-76.9985	2nd Quintile
8	38.87143	-76.9774	2nd Quintile
8	38.84184	-77.0045	2nd Quintile
8	38.86316	-76.9728	2nd Quintile
8	38.84474	-77.0086	2nd Quintile
8	38.84359	-76.9776	2nd Quintile
8	38.86845	-76.9809	2nd Quintile
8	38.869	-76.9822	1st Quintile
8	38.82712	-76.9985	1st Quintile
8	38.85715	-76.9934	1st Quintile
8	38.8673	-76.9808	1st Quintile

8	38.82946	-76.9985	1st Quintile
8	38.84249	-76.9885	1st Quintile
8	38.82922	-76.9965	1st Quintile
8	38.84873	-77.0009	1st Quintile
8	38.84367	-76.9773	1st Quintile
8	38.84125	-77.0036	1st Quintile
8	38.87254	-76.975	1st Quintile
8	38.87068	-76.9822	1st Quintile
8	38.8719	-76.975	1st Quintile
8	38.86052	-76.9936	1st Quintile
8	38.84402	-76.9995	1st Quintile
8	38.8533	-76.9732	1st Quintile
8	38.83953	-77.0051	1st Quintile
8	38.86947	-76.9822	1st Quintile
8	38.84614	-76.9959	1st Quintile
8	38.84376	-76.9894	1st Quintile
8	38.83997	-76.9937	1st Quintile
8	38.8635	-76.9704	1st Quintile
8	38.86956	-76.9787	1st Quintile
8	38.84498	-76.9709	1st Quintile
8	38.8288	-77.0094	1st Quintile
8	38.86511	-76.9708	1st Quintile
8	38.8701	-76.9731	1st Quintile
8	38.83128	-77.0075	1st Quintile
8	38.82608	-77.0124	1st Quintile
8	38.85009	-76.966	1st Quintile
8	38.82583	-76.9987	1st Quintile
8	38.87074	-76.9732	1st Quintile
8	38.86594	-76.9703	1st Quintile
8	38.84671	-76.9772	1st Quintile
8	38.84436	-76.9846	1st Quintile
8	38.82701	-77.0097	1st Quintile
8	38.84407	-76.9947	1st Quintile
8	38.84076	-77.0049	1st Quintile
8	38.84491	-77.0065	1st Quintile
8	38.8301	-76.998	1st Quintile
8	38.8696	-76.979	1st Quintile
8	38.86276	-76.9721	1st Quintile
8	38.87035	-76.977	1st Quintile
8	38.83685	-77.007	1st Quintile
8	38.87075	-76.971	1st Quintile
8	38.86947	-76.971	1st Quintile
8	38.82502	-76.9985	1st Quintile
8	38.84224	-76.994	1st Quintile
8	38.82519	-77.0091	1st Quintile
8	38.84287	-76.98	1st Quintile
8	38.84429	-76.9966	1st Quintile

8	38.827	-77.0106	1st Quintile
8	38.84887	-76.981	1st Quintile

CERTIFICATE OF SERVICE

I hereby certify that on this 28th day of February 2023, I caused true and correct copies of the Strategic Electrification Study to be emailed to the following:

Christopher Lipscombe
General Counsel
Public Service Commission
1325 G Street, N.W.
Suite No. 800
Washington, D.C. 20005
LWalt@psc.dc.gov

Sarah Kogel-Smucker
Assistant People's Counsel
Office of the People's Counsel
1133 15th Street, N.W.
Suite 500
Washington, D.C. 20005
ssmucker@opc-dc.gov

Cathy Thurston-Seignious
Washington Gas Light Company
1000 Maine Ave. SW
Washington, D.C. 20024
cthurston-seignious@washgas.com

Dennis Jamouneau
Potomac Electric Power Company
701 9th Street, NW
Suite 1100, 10th Floor
Washington, D.C. 20068
djamouneau@pepcoholdings.com

Barbara Mitchell
D.C. Water
5000 Overlook Ave. SW
Washington, D.C. 20032
Barbara.mitchell@dcwater.com

Nina Dodge
DC Climate Action
6004 34th Place N.W.
Washington, D.C. 20015
ndodge342@gmail.com

Kevin Auerbacher
Tesla, Inc.
1050 K Street, N.W., Suite 101
Washington, D.C. 20001
kauerbacher@tesla.com

Timothy Oblerteiton, Esq.
Earthjustice
1625 Massachusetts Ave. N.W., Ste 702
Washington, D.C. 20036
toblerteiton@earthjustice.org

Frann G. Francis
Apartment and Office Building Assoc.
1025 Connecticut Avenue NW, Ste. 1005
Washington, DC 20036
Ffrancis@aoba-metro.org

Erin Murphy
Environmental Defense Fund
1875 Connecticut Ave. NW Ste. 600
Washington, DC 20009
emurphy@edf.org

Brian J. Petruska, Esq.
LIUNA Mid-Atlantic Region 11951
Freedom Drive, Suite 310
Reston, VA 20190
bpetruska@maliuma.org

Susan Stevens-Miller, Esq.
Earthjustice
1625 Massachusetts Ave. N.W., Ste 702
Washington, DC 20036
smiller@earthjustice.org

Kristi Singleton, Esq.
U.S. General Services Administration
1800 F Street, NW
Room 2016
Washington, D.C. 20405
Kristi.singleton@gsa.gov

Katherine Morrone, Esq.
Venable L.L.C.
600 Massachusetts Ave. NW
Washington, D.C. 20001
kwmorrone@venable.com

Bernice Corman, Esq.
Bicky Corman Law
800 Connecticut Ave. NW
Suite 430
Washington, D.C. 20405
bcorman@bickycormanlaw.com

Eric Wallace, Esq.
GreeneHurlocker PLLC
4907 Monument Ave
Suite 200
Richmond, VA. 23230
ewallace@greenehurlocker.com

Larry Martin
D.C. Consumer Utility Board
1631 Newton St. NW
Washington, D.C. 20011
lmartindc@gmail.com

/s/ Brian Caldwell
Brian Caldwell

DOEE COMMENTS

EXHIBIT 2

GOVERNMENT OF THE DISTRICT OF COLUMBIA
OFFICE OF THE ATTORNEY GENERAL

KARL A. RACINE
ATTORNEY GENERAL

Public Advocacy Division
Social Justice Section

ELECTRONIC FILING

November 30, 2021

Ms. Brinda Westbrook-Sedgwick
Public Service Commission
Of the District of Columbia Secretary
1325 G Street, NW, Suite # 800
Washington, DC 20005

Re: Formal Case No. 1154 – In the Matter of Washington Gas Light Company's Application for Approval of a PROJECT*pipes* 2 Plan,
&
Formal Case No. 1130 – In the Matter of the Investigation into Modernizing the Energy Delivery System for Increased Sustainability.

Dear Ms. Westbrook-Sedgwick:

On behalf of the District of Columbia Government, please find the enclosed "2021 Fugitive Methane Emission Survey of the District of Columbia" commissioned by the Department of Energy and Environment for filing in the above-captioned proceedings. If you have any questions regarding this filing, please do not hesitate to contact the undersigned.

Respectfully submitted,

KARL A. RACINE
Attorney General

By: */s/ Brian Caldwell*
BRIAN CALDWELL
Assistant Attorney General
(202) 727-6211 – Direct

Email: brian.caldwell@dc.gov

cc: Service List

2021 Fugitive Methane Emission Survey of the District of Columbia

For the District of Columbia Department of Energy and Environment

October 31, 2021

Bob Ackley
Gas Safety, USA
16 Brook Lane, Southborough, MA 01772
robert.c.ackley@gmail.com
508-344-9321

Nathan Phillips
Department of Earth and Environment
Boston University
685 Commonwealth Avenue
Boston, MA 02215
nathan@bu.edu
617-997-1057

Table of Contents

Executive Summary by the Department of Energy and Environment

The purpose of this study is to initiate the first part of an overall study by the Department of Energy and Environment (DOEE) to understand how best to reduce methane emissions associated with the use of natural gas in the District and how such reductions may occur cost-effectively. This first part is a preliminary survey of where fugitive methane emissions may be occurring, and, more importantly, to identify where such emissions may become a concern from a climate change mitigation perspective, due to their potential for high-volume emissions.

It should be emphasized that the scope of this survey does not include an evaluation of safety. Safety determinations are made by Washington Gas using their site-specific criteria for identifying safety risks, and they are outside the scope of the survey. Air methane concentration readings that were obtained in this survey, whether low or high, are not intended to serve as indicators of safety or hazardousness.

Leaks from natural gas infrastructure contribute to climate change, damage trees, create potential safety risks, degrade air quality, and waste ratepayer money. Identifying the locations of high-volume leaks can help reduce GHG emissions effectively, and understanding where leaks may be occurring can inform policy development for a strategic and manageable transition toward decarbonized heating.

The technical consultants performed a methane (CH_4) emission survey of residential neighborhoods in the District of Columbia, during April - June, 2021. They used a high-precision, vehicle-mounted methane analyzer equipped with a Global Positioning System, to survey and map surface methane emissions detected across 713 centerline miles in the District. They identified 3,346 locations where the analyzer detected methane at concentration levels higher than ambient background levels. Methane can come from sources other than natural gas pipelines, including broken sewer mains, landfills, and wetlands. Therefore, this study established strong correlations of identified methane emission points to natural gas pipes: they verified a sample set of vehicle-detected air methane concentration readings with subsurface measurements of combustible gas. For this sample set, every methane emission point they verified in the subsurface was in close spatial proximity to a natural gas main, valve, or service line, indicating that the detected methane emission points are overwhelmingly caused by leaking natural gas infrastructure. These detections take into account the naturally-occurring ambient background levels of methane, which can vary by location and time of day due to wind conditions as well as proximity of methane emission points to analyzer.

Based on this survey and in its subsequent analyses, DOEE will prioritize the identification of leak locations that have the potential to produce high-volume emissions. Scientific studies on methane leaks from natural gas distribution systems suggest that a small percentage of the overall number of leaks in a given system may be responsible for a majority of the overall volume of the leaks from the system. For example, for the gas distribution system in Boston, 7% of the leaks were shown to be contributing 50% of the total methane emissions that were measured. Therefore, DOEE presumes that of the 3,346 locations of fugitive methane emissions that were detected in this survey, a relatively small percentage of those locations may be contributing a large portion of the overall fugitive emissions from the system, and DOEE will further investigate the emissions at those locations to quantify the volume of emissions. Air methane concentration levels alone are not a reliable indicator of the overall volume of fugitive emissions, which requires further analysis, and various methods for estimating the volume of emissions are described in the report. The overall numbers are equivalent to a frequency of about 4.7 methane emission points per centerline road mile, with some of the older neighborhoods showing a higher frequency.

We emphasize that while it makes good sense to prioritize and further analyze and address the high-volume locations with high air methane concentration level readings, it must be remembered that a leak extent analysis could show some leaks with low air methane concentration level readings can also produce high volumes of emissions.

Acknowledgements: The report authors thank Dominic Nicholas for performing algorithm development, programming, data processing and analysis, GIS mapping and data visualization; and Julian Phillips for providing vehicle navigation support and graphics support. Gas Safety, Inc., and Nathan Phillips are wholly responsible for the content and data reported herein.

1. Introduction

Leaks from natural gas infrastructure constitute problems across a wide spatial range. At the point of a leak, methane (CH_4), the largest constituent of natural gas, can build up in confined spaces to hazardous levels. Near the point of a gas leak, gas displaces oxygen in soils, damaging vegetation including trees (Schoellart et al. 2020). At the scale of communities, gas leaks degrade air quality, promoting the formation of surface level ozone and formaldehyde, both of which are damaging to health (West et al. 2006). At the global scale, gas leaks contribute to climate change, as the largest constituent of natural gas, methane, is a powerful greenhouse gas (IPCC 2013). Finally, gas leaks represent lost ratepayer money. In 2019, the most recent reporting year, the District of Columbia had the highest percent lost gas[1] (6.2%) among the US states and the District of Columbia. The volume of lost gas in 2019 (19 million therms), at a nominal price of natural gas in the District of $1.25/therm, represents a lost value of approximately $24M.

Most gas leaks in the pipeline distribution systems in cities and towns are associated with old, leak-prone pipe, some over a century old, of which cities along the US eastern seaboard have relatively large proportions. In 2013, we published the first study of its kind, detecting and mapping 3,356 gas leaks from natural gas distribution pipeline infrastructure in Boston, MA (Phillips et al., 2013). In 2014, this same team conducted and published a study documenting 5,893 gas leaks across approximately 1,500 centerline road miles of the District of Columbia (Jackson et al., 2014). The study reported here focuses on residential sections of the District of Columbia, serviced by gas, for the D.C. Department of Energy and Environment.

2. Context

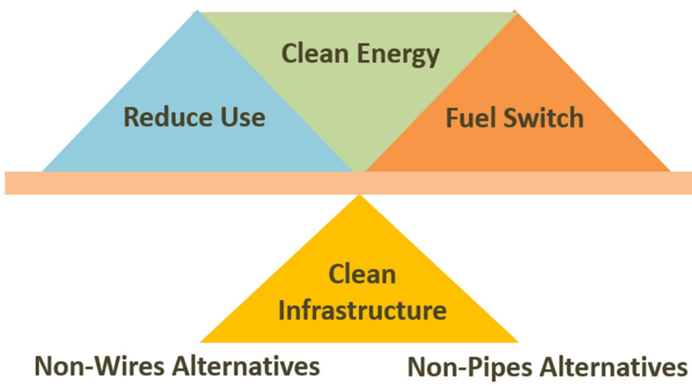
This study is conducted to help advance the District Government's building decarbonization policy, and to inform DOEE's ongoing intervention in Formal Cases 1154 and 1167 regarding, respectively, Washington Gas's pipe replacement program called PROJECTpipes (currently in Phase 2)[2] and climate change programs. The District of Columbia is committed to doing its part to meet the challenge, as described in the 2015 Paris Climate Accord, of keeping the rise of

---

[1] "Lost Gas" is defined by the US Energy Information Administration as "known volumes of natural gas that were the result of leaks, damage, accidents, migration, and/or blow down within the State in which these events took place.

[2] The purpose of PROJECTpipes is not about identifying and fixing actual leaks that are occurring, and Washington Gas already has a leak repair program. Rather, the purpose is to prevent or mitigate *potential future* leaks by replacing all pipes without accounting for building electrification. Furthermore, the method of prioritizing pipes for replacement is based on an algorithmic forecast of potential future leaks, meaning that some of the pipes targeted for replacement may not be leaking at all currently and may go unused in a future of all-electric buildings.

global warming to well below 2°C from pre-industrial levels and to pursue efforts to limit the increase to 1.5 °C. Achieving this goal requires that the world reach carbon neutrality around 2050, and DOEE's Clean Energy DC Plan noted that hitting the 2050 GHG carbon neutral target will require the District to eliminate fossil fuel use:[3]



The District's decarbonization policy rests on the three pillars of energy use reduction, clean energy supply, and fuel switching, and these pillars in turn rely on the availability of clean energy delivery infrastructure.[4] This means, for the electricity infrastructure, a modernized grid that maximizes and promotes the use of Distributed Energy Resources and microgrids, and, for the natural gas system, it means prudently downsizing—via strategies such as non-pipe alternatives--the pipe system to minimize the stranded costs caused by building decarbonization, and to eliminate leaks emitting high volumes of methane.

In Formal Case 1167, DOEE commented that Washington Gas's climate business plan proposes selling natural gas for space heating and cooking well past 2050, premised on a completely replaced pipe system, which are contrary to the District's decarbonization efforts. Similarly, in Formal Case 1154, DOEE testified that PROJECTpipes will result in very small reductions of GHG emissions despite the high cost of the program (an overall cost ranging from $3 billion to $4.5 billion by 2055). PROJECTpipes doubles down on an infrastructure designed to deliver fossil fuels when District policies and market trends are rapidly moving away from the use of fossil fuels in buildings.[5] DOEE testified that building electrification be considered as a non-pipe alternative, similar to the non-wire alternative using distributed energy resources in the electricity sector, to PROJECTpipes. DOEE recommended in its testimony that to reduce the

---

[3] Clean Energy DC, p. 156. Specifically, the Clean Energy DC plan states that achieving the District's 2050 GHG carbon neutral target will require the District to phase out the use of natural gas in buildings. Therefore it is readily apparent that the Company's effort to completely rebuild a natural gas delivery system by 2054 with $3 - $4.5 billion in ratepayer funds is directly at odds with the District's climate goals.

[4] See Clean Energy DC Plan, "Transforming to a Low Carbon District".

[5] See Clean Energy DC Plan, p.24, p.156:

> To achieve its 2032 GHG target, the District will clearly need to shift away from fossil fuels for buildings (natural gas and fuel oil) and transportation (gasoline and diesel) while simultaneously decarbonizing its electricity supply. For buildings, this will mean shifting to non-fossil fuel sources for heat and hot water. …. Consequently, the District must transition away from equipment and technologies that currently depend on such fuels. The equipment used to heat and cool space and water in buildings is a key aspect of this transition.

future risks of pipe leaks, (1) all of the leaks in the District be mapped using high-sensitivity leak detectors, then (2) prioritize the replacement of pipes based on the map's findings, first exploring the viability of the Non-Pipe Alternative approach. This study furthers these decarbonization objectives, and it helps to identify critical issues related to human health and equity associated with the use of fossil fuel appliances.

3. Scope of Work

We surveyed surface methane emission points on public roads in selected residential areas of the District of Columbia as specified by the Department of Energy and Environment (Figure 1). Methane can come from sources other than natural gas pipelines, including broken sewer mains, landfills, and wetlands. Therefore, this study detected methane leaks as a broader category than natural gas leaks, and it was necessary to establish strong correlations of identified emissions points to natural gas pipes.

Our prior work in Boston and the District of Columbia showed that the vast majority of leaks detected from under streets and sidewalks bore a distinct chemical signature of natural gas methane (Jackson et al. 2014; Phillips et al. 2013). Moreover, the spatial signature of wetland and landfill leaks is distinctly different from that of pipeline leaks. Fugitive emissions from leaky pipes are recognizable as abrupt and highly localized spikes in methane concentration, whereas wetland and landfill methane emissions manifest as sloping, gradual deviations from a baseline methane concentration.

To ensure that the identified fugitive methane emissions emanated from natural gas pipes, we verified the source of emissions detected in our mobile survey, by investigating a subsample of detected fugitive emissions from the mobile survey using a hand-held combustible gas indicator with subsurface probe, walking the vicinity of detected locations in air to verify whether they were spatially associated with subsurface gas near natural gas pipeline infrastructure. Secondarily, we verified whether methane emissions were from gas pipelines by detecting the odor of the mercaptan odorant added to pipeline gas.

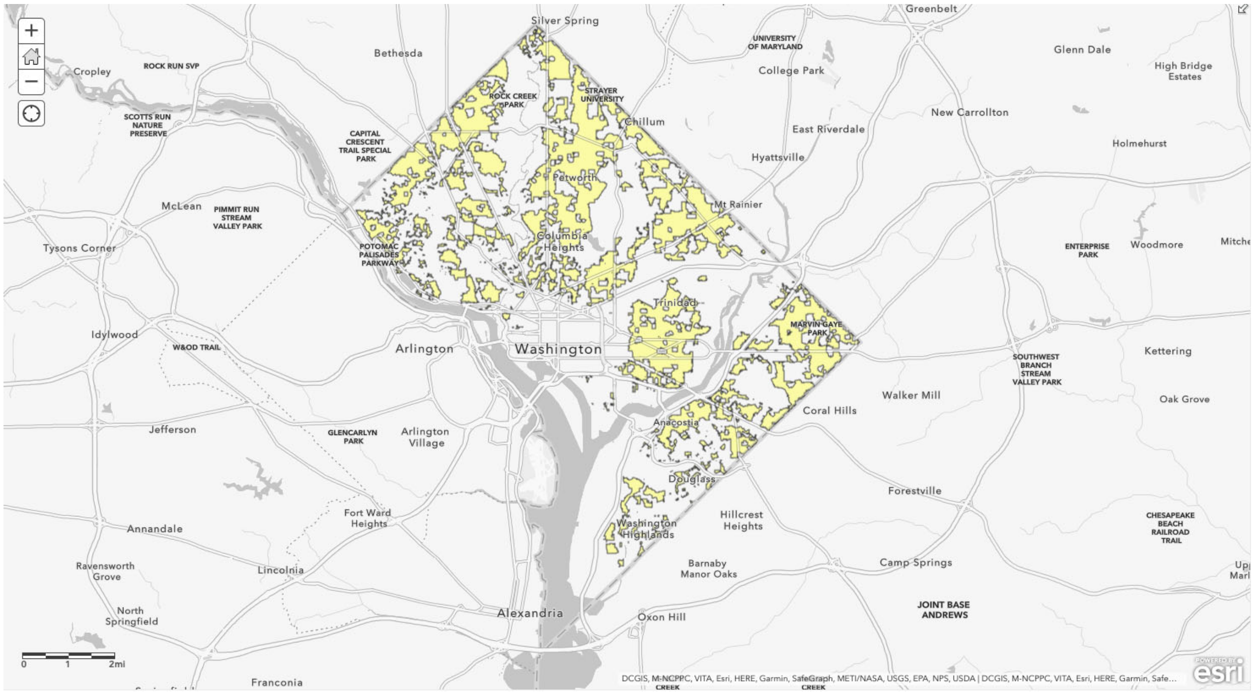


Figure 1. Areas (in yellow) of the District of Columbia specified by DOEE to be surveyed for methane leaks along public roads.

Our road methane emission survey covered approximately 99% of the public roads in the specified areas of the District (Figure 2), covering 713 centerline road miles, in accordance with DOEE's need to address the climate change and health impacts of methane leaks in residential neighborhoods. Reasons for not surveying 100% of public roads in residential neighborhoods included protracted road work, and recent pedestrianization of some streets.

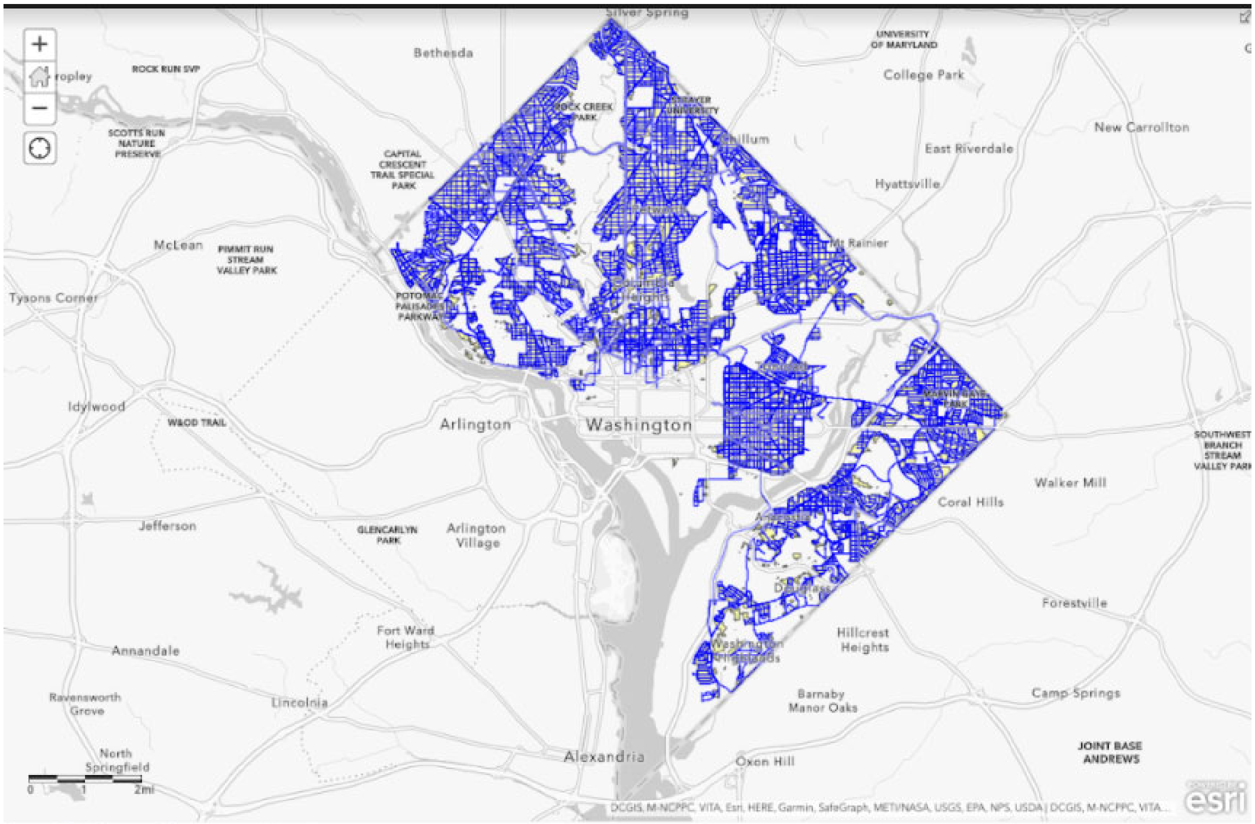


Figure 2. Roads Driven and surveyed for methane leaks between April and June 2021, overlain on the specified areas depicted in yellow and Figure 1.

It is important to recognize that peak concentration data typically, but do not automatically nor reliably lead to the rate of methane volume emitted from each leak. This is due to a combined effect of variable proximity of each leak to the analyzer inlet as it is driven past, and to vagaries of wind that could blow a leak plume in any direction while the analyzer is being driven past it. For this reason, we traveled every road in the specified areas of interest at least twice. Although the combination of leak proximity to analyzer and wind conditions do not often create "all things being equal" conditions, it is the case that when all conditions *are* equal or at least similar, a higher peak concentration in a plume indicates a larger leak, so the higher peak concentration leaks do provide useful information as an initial indication of potentially large leaks, which, however, necessitate follow-up on-the-ground measurements to confirm.

For an estimate of the volume flux of methane emitted from each leak, a future, second phase of this research will be needed. There are several potential approaches to quantifying the volume of or categorizing the size of individual gas leaks. These approaches fall into three general categories: 1) ground-based measurements of gas emanating from the surface (e.g., Hendrick et al. 2016); 2) meteorological measurement and modeling of the size and movement of gas plumes using wind speed and direction measurements (e.g., Jackson et al. 2014; von

Fischer et al. 2017); and 3) plume spectroscopic methods that measure the absorption of radiation by methane plumes (described in Magavi 2018).

Each of the leak quantification methods has pros and cons. Ground-based measurements using chambers, as in Hendrick et al. (2016), provide direct, relatively accurate quantification of leaks using simple measurements, but is a laborious and time-consuming process, which can take many hours per leak. “Plume mapper” approaches similar to those described in Jackson et al. (2014) and von Fischer et al. (2017) are efficient methods to bin leaks into categorical sizes, but they rely on statistical models of leak size that are developed on a separate test set of leaks that may not represent the same geometric complexity of streetscapes or spatially complex leak loss points. The spectroscopic method described in Magavi (2018) is in principle the easiest and most reliably integrative of the entirety of a leak in space, as it simply uses and measures focused light passing through an entire plume, but this method is still in the research and development phase.

A variant on the ground-based method called the “leak extent method”, described in Magavi (2018) and Magavi et al. (2019), consists of making simple estimates of leak size based on the leak square footage. This is an operationally efficient surrogate method to determine leak size category (small, medium, large) based on simple subsurface measurements determining the areal extent of the presence of subsurface gas associated with a leak.

Our research team is equipped for and skilled in making any or a combination of the techniques described above (except for the plume spectroscopic method), in a second phase of this study.

4. Results and Discussion

We detected methane in 3,346 surface locations that exceeded background levels of methane in air across the residential areas of the District of Columbia. The table below shows the overall number of detections by District Wards. Using a statistical sample, we subsequently verified that most of these emissions were coming from the natural gas delivery system.

Ward	# of surface methane emission points above background levels
1	218
2	288
3	595
4	691
5	523
6	554
7	309
8	160

The report includes an Attachment A of the identified methane emission locations and the associated concentration levels that are indicated in quintiles. DOEE can provide the numerical values associated with each location upon specific locational request. The spatial density of methane emission points appeared to be relatively evenly distributed across the study areas. In addition to the point locations, leak density variation, which may be useful in policy decisions on addressing leaks at the street or neighborhood scale, are shown in Figure 3.

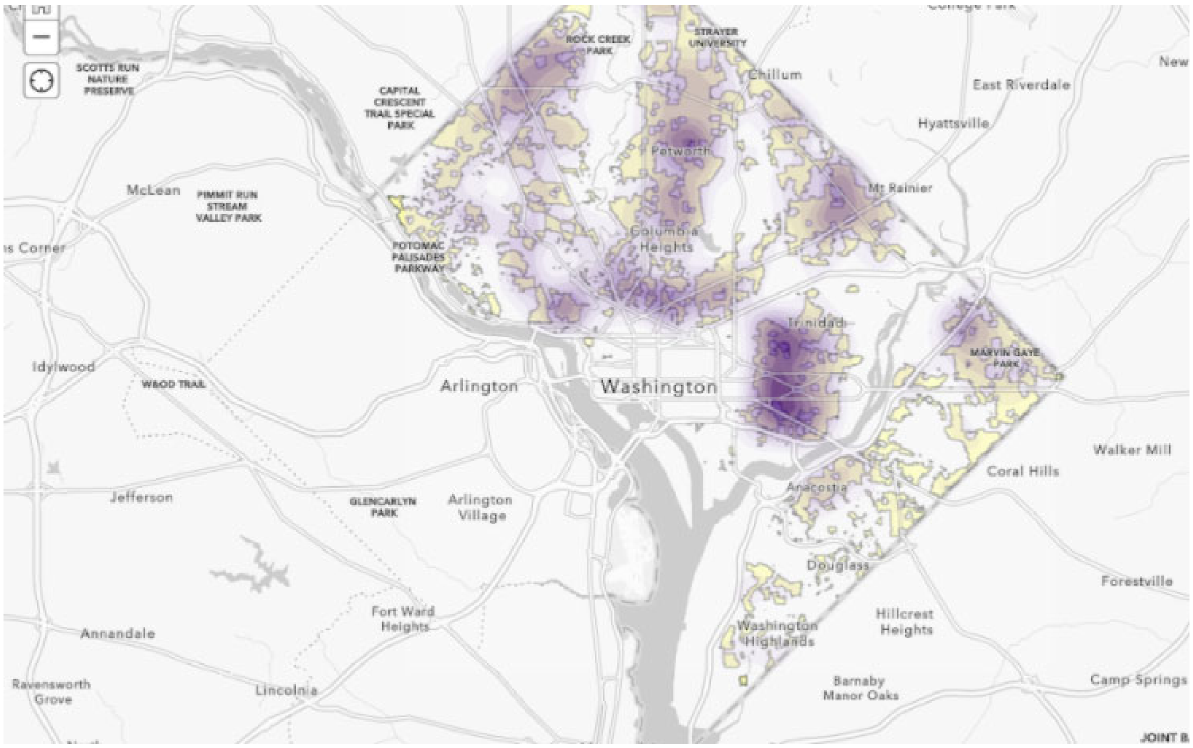


Figure 3. Density of methane emission point distributions.

For verification, forty emission points were selected based on preliminary observations of point [CH_4] elevations, distributed across the District and representing small, medium and large observed methane concentrations (Figure 4). The verification method is explained in Appendix 1. We identified elevated subsurface methane in 39 of the 40 locations, and in every one of the locations in which elevated subsurface methane was found, it was closely spatially associated with a gas main, valve, or service line. Individual reports for each of the 40 verifications are available upon request. These results indicate that analyzer sensitivity to natural gas leaks is high, even for small ones or those that may originate on service lines under sidewalks and yards, or from building meters.

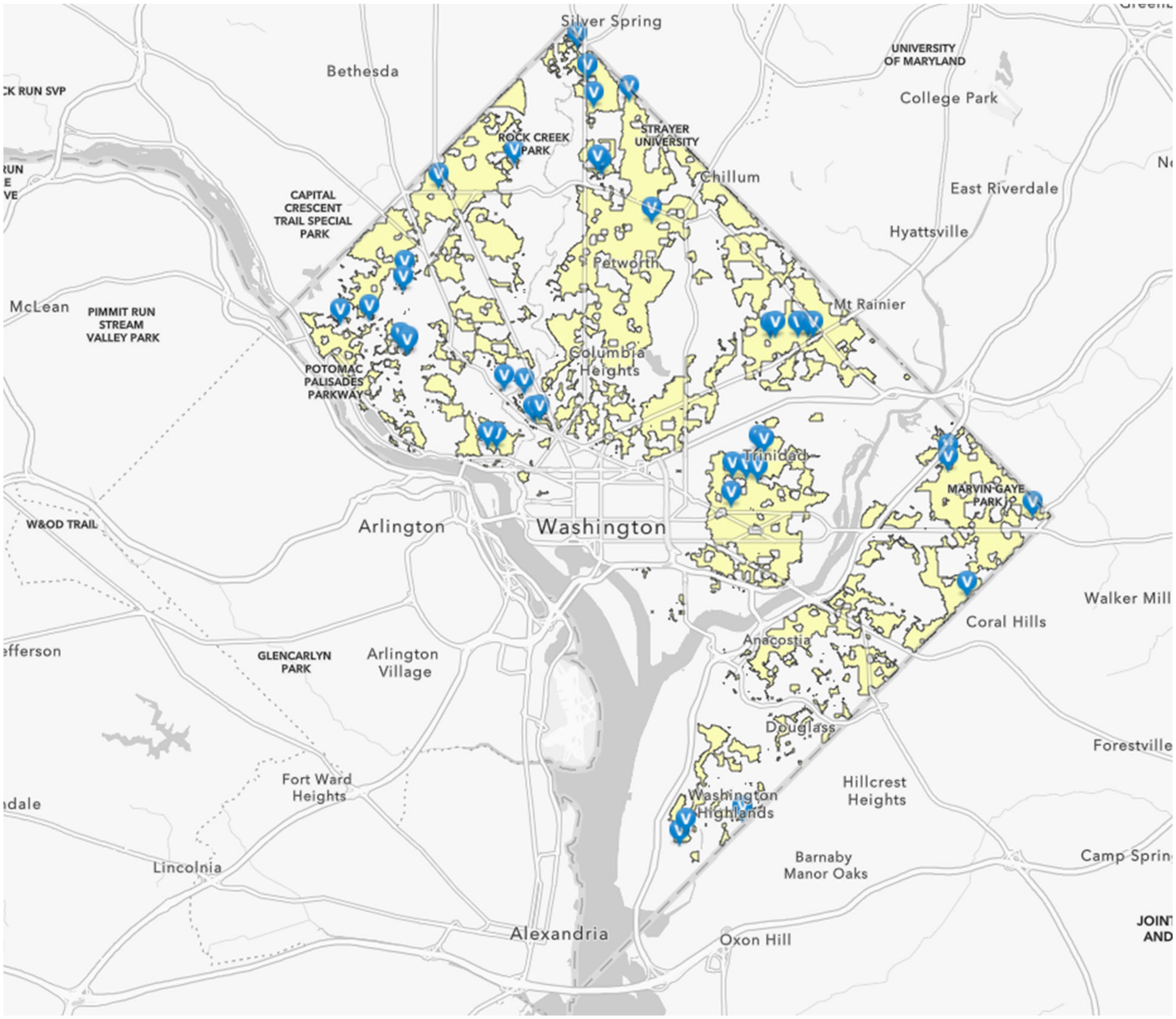


Figure 4. Location of forty leak verifications. A combustible gas indicator with subsurface probe was used to find subsurface leak origins associated with leaks detected by the mobile survey.

Future improvements on this study would include obtaining the complete pipeline inventory and map, and a map of the operating pressures of the pipes in the District of Columbia, from Washington Gas. These data would help explain why certain roadways in the District had a higher spatial density of leaks than others, and it would allow for an estimate of the likely rankings of leak rates from particular lengths of pipeline. Among the low-pressure distribution pipelines, operating pressures can vary substantially, from 0.5 psi to 90 psi or more. Generally, all things being equal, a leak in a pipe will leak at a rate that is proportional to the pipeline operating pressure, so leaks we found in zones of higher operating pressure will be expected to leak at higher rates.

Although peak methane concentrations observed from the mobile survey offer a rough indication of leak size, it is itself not a reliable indicator of leak sizes because of the vagaries of wind speed and direction that make the peak concentrations vary from second to second, and from one drive-by to another. Moreover, a mobile survey is unable to determine the actual distance of the leak from the air inlet collection point, as a large, distant leak could potentially appear similar, under certain wind conditions, to a small, near leak. Therefore, a leak sizing study, using one of the enumerated methods described earlier in this document, should be performed, using the one that is best suited for furthering the objectives concerning the District's climate change and health policies.

We emphasize that while it makes good sense to prioritize and further analyze and address the locations with very high air methane concentration level readings, it must be remembered that a leak extent analysis could show that some leaks with low air methane concentration level readings produce high volumes of emissions.

Appendix 1: Materials and Methods

We used a mobile Picarro G2301 Cavity Ring-Down Spectrometer (Picarro, Inc., Santa Clara, CA; http://www.picarro.com/) in all surveys, installed in a vehicle equipped with a geographic positioning system (GPS), and driven on the specified roads. A filtered inlet tube was placed outside the passenger side of the vehicle. The analyzer was periodically tested with <0.01 ppmv, 2.0 ppmv, and 10 ppmv [CH_4] test gas (Scott Marrin, Inc. Riverside, CA). Further detail is provided below and Figure 8 shows analyzer test results.

To determine the lag time between when air was drawn into the filtered inlet and detected by the analyzer, we used a 50 ppm concentration tank of methane to impart a known methane signal at a specified location, driving at a range of speeds typical of actual survey speeds. We determined a lag time of 4.4 seconds (or, 4 records in the data files) best spatially aligned the detected methane signal with its known location.

As roadways in the town being surveyed are driven, the system records parts per billion (ppb) CH4 concentration each 1.1 seconds, along with latitude-longitude GPS coordinates. Per the lag test described above, in each data file we shifted the apparent GPS location four rows to correct for the 4.4 second time lag between surface methane emission location and analyzer detection.

We started and stopped recording data into individual files representing survey micro-areas likely to have similar ambient conditions, and therefore the DC survey resulted in many individual files of [CH_4] readings by geo-position. The DC survey produced 282 data files over 23 days between April 5 and June 26, 2021. Of these 282 files, 176 were used in this analysis, the remainder being extraneous (e.g., files started and ended in a stopped location).

To distinguish discrete leaks from the spatially continuous raw methane concentration data, a modified Tau approach (Keyes et al. 2020; Olewuezi et al., 2015) was used to perform outlier detection on the raw spatial methane concentration data. This method is a statistical approach to support deciding whether to keep or discard suspected outliers in a population sample, in this case an individual [CH_4] measurement. A threshold methane level that meets the outlier category, indicating a leak, is calculated by the data file's CH_4 sample size, sample average, sample standard deviation, and desired confidence level.

To avoid double-counting methane emission points that were driven past multiple times, a procedure was used to eliminate multiple outliers within a spatial window of 30 m radius from the highest peak methane concentration in the vicinity. Since vehicle lane widths are generally approximately 10 m or less, the 30-meter window is large enough to prevent double-counting but small enough to avoid incorrectly combining separate observed leaks into one.

To test the accuracy of our leak detection, we verified gas in the subsurface, using a handheld Combustible Gas Indicator and probe, from a selection of methane emission points representing small, medium, and large peak concentrations observed across the District. To determine the number of methane emission points to test, we determined to accept a nominal error rate of less than or equal to 5% - that is, that we would accept a “false positive” (assigning a leak where there was none) in less than or equal to 5% of leaks we detected. Practically speaking, this required us to assess at least 20 putatively-detected methane emission points to find if at least one of those emission points did not actually exist as proven by detection of subsurface gas using a hand held probe. In our first 20 emission points, we verified 100% of the detected emissions corresponded to the presence of gas in the subsurface within 30 meters of where our car-based analyzer detected the elevated methane concentrations. We decided to continue to verify detected emission points until we found our first “false positive”, so that we could identify our first non-zero false positive rate. Our 40th reading was a false positive, producing a first false positive rate of 2.5%, at which point we concluded this test as having a satisfactory outcome.

The materials and methods used in this study were similar to those we used in our previous study of methane leaks in the District of Columbia (Jackson et al. 2014), including that both studies used a GPS-equipped Cavity Ringdown Spectrometer mounted in a car. There were two small but important differences in the methods used in the 2014 study and this one. First, the combination of pump speed differences and lengths of the sample tubing from the analyzer to the inlet outside the vehicle differed from that used in a different vehicle and analyzer air pump of the 2014 study, so that the measured, repeatable, and time shift-adjusted lag between injection of a known methane source and detection by the analyzer was 4.4 seconds in this study as compared to ~1 second in Jackson et al. (2014). Secondly, while the 2014 study used an air inlet point ~ 0.5 m above the road surface, this study placed the inlet at ~ 1.0 m above the road surface. This was an intentional decision to provide us with the ability to detect methane leaks from a wider spatial extent than in the 2014 study, as sampling from a greater vertical distance above ground is akin to having a wider scope of view. This decision follows from our improved sensitivity in leak detection we have published subsequent to the 2014 study (Keyes et al., 2020). The expected and observed effect of this methodological change was that the plumes from the methane leaks we detected from 1.0 m above the road surface were characterized by lower peak concentrations than the plumes from leaks observed at ~ 0.5 m above the road surface in the 2014 study.

Instrument calibration checks:

We tested the analyzer prior to the beginning of the survey (March 30, 2021); during a midpoint of the survey (April 19, 2021), and near the conclusion of the survey (June 23, 2021), against nominal 0.0 ppm; 2.0 ppm and 10 ppm test gases in ultrapure air. The test gas tanks were certified to contain < 0.01 ppm; 2.072 ppm; and 10.32 ppm, respectively (+/- 1% NIST). The test results are shown in Figure 8. These results demonstrate that our analyzer was working properly and with adequate precision for the study.

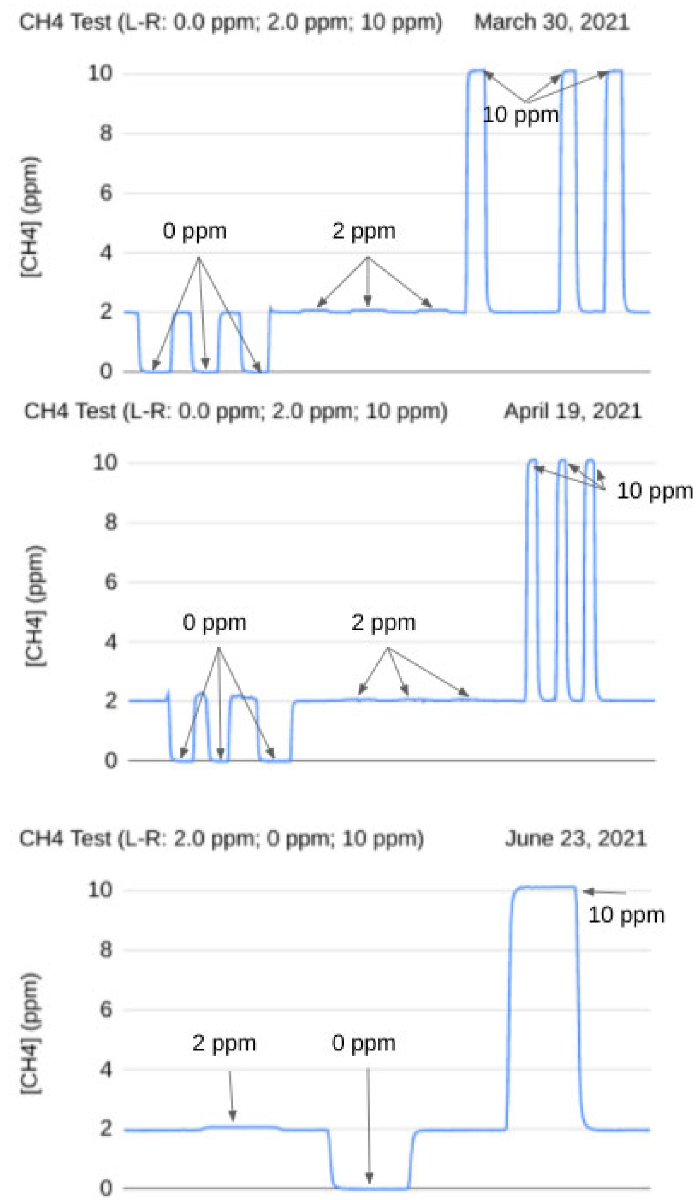


Figure 6. Analyzer calibration checks prior to (top), during (middle) and toward the end (bottom) of the methane leak survey. Triple checks at each of three standards were made in the first two dates and a single check at each of three concentrations was made in the final check.

Appendix 2: Gas Leak Classification

Gas leaks upon detection have traditionally been classified into three categories with each category requiring different repair requirements and timelines. For Washington Gas's leak classification and reporting, please refer to D.C. Municipal Regulations, Title 15, Chapter 37, Reporting and Repairing Requirements for Gas Leaks and Odor Complaints

Appendix 3: References Cited

Hendrick MF, Ackley R, Sanaie-Movahed B, Tang X, Phillips NG (2016) Fugitive methane emissions from leak-prone natural gas distribution infrastructure in urban environments. Environmental Pollution 213, 710-716

IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp, doi:10.1017/CBO9781107415324.

Jackson RB, Down A, Phillips NG, Ackley RC, Cook CW, Plata DL, Zhao K (2014) Natural gas pipeline leaks across Washington, DC, Environmental science & technology 48 (3), 2051-2058

Keyes T, Ridge G, Klein M, Phillips N, Ackley R, Yang Y (2020) An enhanced procedure for urban mobile methane leak detection Heliyon 6 (10), e04876

Magavi Z (2018) Identifying and Rank-Ordering Large Volume Leaks in the Underground Natural Gas Distribution System of Massachusetts. Masters Thesis, Harvard University. https://dash.harvard.edu/handle/1/37945149

Magavi Z, Schulman A, Ackley B, Salgado E, Hendrick M, Phillips NG (2019) Identification of Large Volume Leaks in Natural Gas Distribution Systems AGU Fall Meeting Abstracts 2019, GC51M-0970

Olewuezi NP, Onoghojobi B, Udeoyibo CV (2015) A comparative study of different outlier detection methods in linear regression. Far East Journal of Theoretical Statistics 50:171-179.

Phillips NG, Ackley R, Crosson ER, Down A, Hutyra LR, Brondfield M, Karr JD, Zhao K, Jackson RB (2013) Mapping urban pipeline leaks: Methane leaks across Boston. Environmental pollution 173, 1-4

Schollaert C, Ackley RC, DeSantis A, Polka E, Scammell MK (2020) Natural gas leaks and tree death: A first-look case-control study of urban trees in Chelsea, MA USA. Environmental Pollution 263, Part A, 114464.

Von Fischer JC, Cooley D, Chamberlain S, Gaylord A, Griebenow CJ, Hamburg SP, Salo J, Schumacher R, Theobald D, Ham J (2017) Rapid, Vehicle-Based Identification of Location and Magnitude of Urban Natural Gas Pipeline Leaks. Environmental Science & Technology. 51:4091-4099. DOI: 10.1021/acs.est.6b06095

West JJ, Fiore AM, Horowitz LW, Mauzerall DL (2006) Global health benefits of mitigating ozone pollution with methane emission controls. PNAS. 103, 3988-3993.

ATTACHMENT A

WARD	GPS_ABS_	GPS_ABS_	origCH4
1	38.92575	-77.0297	5th Quintile
1	38.92207	-77.0413	5th Quintile
1	38.93072	-77.0296	5th Quintile
1	38.9141	-77.0317	5th Quintile
1	38.93202	-77.0241	5th Quintile
1	38.92484	-77.0392	5th Quintile
1	38.91793	-77.0239	5th Quintile
1	38.9352	-77.0309	5th Quintile
1	38.93236	-77.0268	5th Quintile
1	38.9328	-77.0352	5th Quintile
1	38.91669	-77.0219	5th Quintile
1	38.92429	-77.0256	5th Quintile
1	38.93358	-77.024	5th Quintile
1	38.91783	-77.047	5th Quintile
1	38.93102	-77.024	5th Quintile
1	38.92921	-77.0195	5th Quintile
1	38.93178	-77.0267	5th Quintile
1	38.93459	-77.0325	5th Quintile
1	38.92353	-77.0415	5th Quintile
1	38.92561	-77.0381	5th Quintile
1	38.93109	-77.0236	5th Quintile
1	38.92154	-77.046	5th Quintile
1	38.92458	-77.0256	5th Quintile
1	38.92764	-77.0369	5th Quintile
1	38.92475	-77.027	5th Quintile
1	38.93359	-77.0244	5th Quintile
1	38.9345	-77.0309	5th Quintile
1	38.93499	-77.0436	5th Quintile
1	38.93326	-77.0364	5th Quintile
1	38.9307	-77.029	5th Quintile
1	38.92157	-77.048	5th Quintile
1	38.92139	-77.0483	5th Quintile
1	38.93236	-77.0297	5th Quintile
1	38.93193	-77.0194	5th Quintile
1	38.93138	-77.0201	5th Quintile
1	38.9335	-77.0298	5th Quintile
1	38.92612	-77.0232	5th Quintile
1	38.9141	-77.0231	5th Quintile
1	38.92698	-77.0356	5th Quintile
1	38.91911	-77.0239	5th Quintile
1	38.93094	-77.0249	4th Quintile
1	38.92524	-77.0379	4th Quintile
1	38.93532	-77.0234	4th Quintile
1	38.92308	-77.0415	4th Quintile
1	38.92753	-77.0273	4th Quintile
1	38.91814	-77.0459	4th Quintile

Ward	Total Leaks
1	218
2	288
3	595
4	691
5	523
6	554
7	309
8	160

1	38.93191	-77.0237	4th Quintile
1	38.92477	-77.0292	4th Quintile
1	38.91784	-77.0442	4th Quintile
1	38.92576	-77.0311	4th Quintile
1	38.93595	-77.0315	4th Quintile
1	38.92575	-77.0286	4th Quintile
1	38.92676	-77.0295	4th Quintile
1	38.92582	-77.0264	4th Quintile
1	38.92416	-77.0226	4th Quintile
1	38.9324	-77.0405	4th Quintile
1	38.92247	-77.0413	4th Quintile
1	38.93068	-77.0228	4th Quintile
1	38.93176	-77.0284	4th Quintile
1	38.93064	-77.0234	4th Quintile
1	38.92786	-77.0373	4th Quintile
1	38.91411	-77.0234	4th Quintile
1	38.93325	-77.0388	4th Quintile
1	38.93331	-77.0427	4th Quintile
1	38.9141	-77.0225	4th Quintile
1	38.92577	-77.0277	4th Quintile
1	38.92379	-77.041	4th Quintile
1	38.91965	-77.0443	4th Quintile
1	38.93294	-77.0249	4th Quintile
1	38.92315	-77.0398	4th Quintile
1	38.92288	-77.0366	4th Quintile
1	38.92322	-77.0433	4th Quintile
1	38.93418	-77.0425	4th Quintile
1	38.92638	-77.0365	4th Quintile
1	38.92719	-77.0368	3rd Quintile
1	38.92758	-77.0235	3rd Quintile
1	38.93071	-77.0277	3rd Quintile
1	38.93657	-77.0309	3rd Quintile
1	38.93289	-77.0254	3rd Quintile
1	38.92578	-77.027	3rd Quintile
1	38.91983	-77.0319	3rd Quintile
1	38.92058	-77.0469	3rd Quintile
1	38.91411	-77.0291	3rd Quintile
1	38.92522	-77.0388	3rd Quintile
1	38.92477	-77.0306	3rd Quintile
1	38.9141	-77.0248	3rd Quintile
1	38.91783	-77.0439	3rd Quintile
1	38.9141	-77.0283	3rd Quintile
1	38.92485	-77.0261	3rd Quintile
1	38.92082	-77.024	3rd Quintile
1	38.91598	-77.026	3rd Quintile
1	38.93246	-77.0401	3rd Quintile
1	38.93527	-77.0238	3rd Quintile

1	38.92074	-77.0482	3rd Quintile
1	38.92167	-77.0253	3rd Quintile
1	38.92377	-77.0297	3rd Quintile
1	38.92062	-77.0319	3rd Quintile
1	38.93195	-77.0246	3rd Quintile
1	38.93458	-77.0316	3rd Quintile
1	38.92477	-77.0309	3rd Quintile
1	38.92163	-77.0413	3rd Quintile
1	38.92957	-77.0297	3rd Quintile
1	38.92856	-77.0297	3rd Quintile
1	38.93031	-77.0297	3rd Quintile
1	38.93626	-77.0297	3rd Quintile
1	38.91641	-77.0436	3rd Quintile
1	38.92233	-77.0451	3rd Quintile
1	38.92622	-77.0297	3rd Quintile
1	38.92576	-77.0293	3rd Quintile
1	38.92745	-77.0297	3rd Quintile
1	38.93275	-77.0388	3rd Quintile
1	38.93212	-77.0334	3rd Quintile
1	38.92209	-77.0253	3rd Quintile
1	38.93258	-77.0346	3rd Quintile
1	38.92971	-77.0413	3rd Quintile
1	38.9241	-77.0406	3rd Quintile
1	38.93597	-77.0212	3rd Quintile
1	38.91806	-77.0463	3rd Quintile
1	38.91875	-77.0246	3rd Quintile
1	38.92506	-77.0297	3rd Quintile
1	38.92789	-77.0377	2nd Quintile
1	38.92802	-77.041	2nd Quintile
1	38.91432	-77.0165	2nd Quintile
1	38.92333	-77.0418	2nd Quintile
1	38.93422	-77.0241	2nd Quintile
1	38.92632	-77.0357	2nd Quintile
1	38.93457	-77.0375	2nd Quintile
1	38.93133	-77.0214	2nd Quintile
1	38.91649	-77.0423	2nd Quintile
1	38.93458	-77.0302	2nd Quintile
1	38.92837	-77.0372	2nd Quintile
1	38.91719	-77.0159	2nd Quintile
1	38.92038	-77.0441	2nd Quintile
1	38.93465	-77.0226	2nd Quintile
1	38.92705	-77.0271	2nd Quintile
1	38.91716	-77.0219	2nd Quintile
1	38.93611	-77.0321	2nd Quintile
1	38.93371	-77.0364	2nd Quintile
1	38.93531	-77.0312	2nd Quintile
1	38.93644	-77.0205	2nd Quintile

1	38.93239	-77.0341	2nd Quintile
1	38.9186	-77.0239	2nd Quintile
1	38.92316	-77.0473	2nd Quintile
1	38.9315	-77.0267	2nd Quintile
1	38.91665	-77.042	2nd Quintile
1	38.92058	-77.0326	2nd Quintile
1	38.91692	-77.0463	2nd Quintile
1	38.92678	-77.0266	2nd Quintile
1	38.9141	-77.0307	2nd Quintile
1	38.93388	-77.0239	2nd Quintile
1	38.93419	-77.042	2nd Quintile
1	38.92767	-77.0291	2nd Quintile
1	38.92313	-77.0403	2nd Quintile
1	38.93109	-77.0212	2nd Quintile
1	38.92925	-77.039	2nd Quintile
1	38.92991	-77.0297	2nd Quintile
1	38.93206	-77.0386	2nd Quintile
1	38.93334	-77.0413	2nd Quintile
1	38.92087	-77.0235	2nd Quintile
1	38.92823	-77.023	2nd Quintile
1	38.93477	-77.021	2nd Quintile
1	38.92664	-77.027	2nd Quintile
1	38.9356	-77.0213	2nd Quintile
1	38.93438	-77.0363	2nd Quintile
1	38.928	-77.0243	2nd Quintile
1	38.92629	-77.027	2nd Quintile
1	38.92481	-77.0265	2nd Quintile
1	38.92432	-77.0391	2nd Quintile
1	38.91643	-77.027	2nd Quintile
1	38.93206	-77.0267	2nd Quintile
1	38.93148	-77.0453	2nd Quintile
1	38.93072	-77.0222	2nd Quintile
1	38.92695	-77.0212	1st Quintile
1	38.93034	-77.0198	1st Quintile
1	38.91783	-77.0429	1st Quintile
1	38.92768	-77.0287	1st Quintile
1	38.9235	-77.0437	1st Quintile
1	38.92774	-77.0297	1st Quintile
1	38.93275	-77.0454	1st Quintile
1	38.9141	-77.0311	1st Quintile
1	38.92973	-77.0433	1st Quintile
1	38.91592	-77.0145	1st Quintile
1	38.92309	-77.0412	1st Quintile
1	38.93069	-77.0371	1st Quintile
1	38.91558	-77.0301	1st Quintile
1	38.91917	-77.0447	1st Quintile
1	38.92902	-77.0228	1st Quintile

1	38.91863	-77.0446	1st Quintile
1	38.92641	-77.0255	1st Quintile
1	38.93347	-77.0259	1st Quintile
1	38.93617	-77.0221	1st Quintile
1	38.93415	-77.0272	1st Quintile
1	38.93122	-77.044	1st Quintile
1	38.92538	-77.027	1st Quintile
1	38.93391	-77.0231	1st Quintile
1	38.93565	-77.0309	1st Quintile
1	38.93131	-77.0198	1st Quintile
1	38.9346	-77.0369	1st Quintile
1	38.93255	-77.0237	1st Quintile
1	38.92259	-77.0271	1st Quintile
1	38.92064	-77.0401	1st Quintile
1	38.92392	-77.0256	1st Quintile
1	38.91783	-77.0423	1st Quintile
1	38.93531	-77.0326	1st Quintile
1	38.93003	-77.0217	1st Quintile
1	38.9346	-77.0221	1st Quintile
1	38.93097	-77.0383	1st Quintile
1	38.91833	-77.0239	1st Quintile
1	38.92235	-77.0459	1st Quintile
1	38.93695	-77.0218	1st Quintile
1	38.92	-77.0322	1st Quintile
1	38.9339	-77.0309	1st Quintile
1	38.93295	-77.0277	1st Quintile
1	38.93202	-77.0309	1st Quintile
1	38.93458	-77.0296	1st Quintile
1	38.93324	-77.0275	1st Quintile
1	38.91811	-77.0354	1st Quintile
1	38.91715	-77.0366	1st Quintile
2	38.90575	-77.026	5th Quintile
2	38.90685	-77.0597	5th Quintile
2	38.90926	-77.0582	5th Quintile
2	38.91539	-77.0729	5th Quintile
2	38.91262	-77.0287	5th Quintile
2	38.91034	-77.0416	5th Quintile
2	38.91356	-77.0735	5th Quintile
2	38.91456	-77.0693	5th Quintile
2	38.90781	-77.026	5th Quintile
2	38.91484	-77.0415	5th Quintile
2	38.91453	-77.045	5th Quintile
2	38.90565	-77.027	5th Quintile
2	38.91227	-77.0582	5th Quintile
2	38.90651	-77.0661	5th Quintile
2	38.90276	-77.027	5th Quintile
2	38.90449	-77.0612	5th Quintile

2	38.90162	-77.0537	5th Quintile
2	38.91113	-77.0298	5th Quintile
2	38.91416	-77.0693	5th Quintile
2	38.91263	-77.0281	5th Quintile
2	38.91108	-77.0271	5th Quintile
2	38.91388	-77.0449	5th Quintile
2	38.90686	-77.0661	5th Quintile
2	38.91628	-77.0508	5th Quintile
2	38.90812	-77.026	5th Quintile
2	38.91038	-77.0341	5th Quintile
2	38.91558	-77.0386	5th Quintile
2	38.91187	-77.0365	5th Quintile
2	38.90965	-77.026	5th Quintile
2	38.91484	-77.0361	5th Quintile
2	38.91113	-77.0362	5th Quintile
2	38.91262	-77.0276	5th Quintile
2	38.91194	-77.0593	5th Quintile
2	38.9104	-77.0331	5th Quintile
2	38.91263	-77.0297	5th Quintile
2	38.90981	-77.0309	5th Quintile
2	38.9136	-77.0727	5th Quintile
2	38.90633	-77.027	5th Quintile
2	38.91053	-77.0281	5th Quintile
2	38.91045	-77.0271	5th Quintile
2	38.90843	-77.0613	5th Quintile
2	38.91419	-77.0416	5th Quintile
2	38.91112	-77.028	5th Quintile
2	38.90686	-77.0581	5th Quintile
2	38.90699	-77.0592	5th Quintile
2	38.90107	-77.0515	4th Quintile
2	38.91882	-77.053	4th Quintile
2	38.91009	-77.0309	4th Quintile
2	38.91558	-77.0416	4th Quintile
2	38.91411	-77.0503	4th Quintile
2	38.90756	-77.0612	4th Quintile
2	38.91187	-77.0307	4th Quintile
2	38.90847	-77.0618	4th Quintile
2	38.9134	-77.0488	4th Quintile
2	38.9096	-77.0288	4th Quintile
2	38.90076	-77.0547	4th Quintile
2	38.90963	-77.0416	4th Quintile
2	38.91536	-77.0746	4th Quintile
2	38.90978	-77.0691	4th Quintile
2	38.91657	-77.0506	4th Quintile
2	38.90845	-77.063	4th Quintile
2	38.90054	-77.0514	4th Quintile
2	38.91335	-77.0502	4th Quintile

2	38.91047	-77.0582	4th Quintile
2	38.91334	-77.0507	4th Quintile
2	38.90928	-77.0633	4th Quintile
2	38.91407	-77.0435	4th Quintile
2	38.91167	-77.0679	4th Quintile
2	38.90941	-77.0305	4th Quintile
2	38.91562	-77.0506	4th Quintile
2	38.91636	-77.0417	4th Quintile
2	38.91096	-77.0593	4th Quintile
2	38.91039	-77.0323	4th Quintile
2	38.90639	-77.0295	4th Quintile
2	38.90205	-77.0504	4th Quintile
2	38.89972	-77.0533	4th Quintile
2	38.90595	-77.0677	4th Quintile
2	38.90934	-77.0572	4th Quintile
2	38.90934	-77.0599	4th Quintile
2	38.91263	-77.0311	4th Quintile
2	38.91483	-77.0357	4th Quintile
2	38.91832	-77.052	4th Quintile
2	38.9077	-77.0559	4th Quintile
2	38.91538	-77.0739	4th Quintile
2	38.90857	-77.026	4th Quintile
2	38.90737	-77.026	4th Quintile
2	38.91071	-77.0691	4th Quintile
2	38.90673	-77.027	4th Quintile
2	38.90427	-77.027	4th Quintile
2	38.9119	-77.0504	4th Quintile
2	38.91483	-77.0353	4th Quintile
2	38.90768	-77.0596	4th Quintile
2	38.90936	-77.0564	4th Quintile
2	38.90969	-77.0385	4th Quintile
2	38.90928	-77.0557	4th Quintile
2	38.90766	-77.0609	3rd Quintile
2	38.91114	-77.0293	3rd Quintile
2	38.90771	-77.0555	3rd Quintile
2	38.91853	-77.0532	3rd Quintile
2	38.91044	-77.0297	3rd Quintile
2	38.91409	-77.0405	3rd Quintile
2	38.91224	-77.0609	3rd Quintile
2	38.91628	-77.0518	3rd Quintile
2	38.9104	-77.0348	3rd Quintile
2	38.91411	-77.0413	3rd Quintile
2	38.90932	-77.0591	3rd Quintile
2	38.90894	-77.0613	3rd Quintile
2	38.91486	-77.0506	3rd Quintile
2	38.91411	-77.0429	3rd Quintile
2	38.91631	-77.0406	3rd Quintile

2	38.91411	-77.0334	3rd Quintile
2	38.91361	-77.0719	3rd Quintile
2	38.90742	-77.0592	3rd Quintile
2	38.91007	-77.0582	3rd Quintile
2	38.90964	-77.0448	3rd Quintile
2	38.91355	-77.074	3rd Quintile
2	38.90546	-77.0316	3rd Quintile
2	38.90905	-77.0592	3rd Quintile
2	38.90766	-77.06	3rd Quintile
2	38.91179	-77.0284	3rd Quintile
2	38.90614	-77.0661	3rd Quintile
2	38.91421	-77.0449	3rd Quintile
2	38.91698	-77.0411	3rd Quintile
2	38.90929	-77.0629	3rd Quintile
2	38.91106	-77.0416	3rd Quintile
2	38.9141	-77.0329	3rd Quintile
2	38.90073	-77.0488	3rd Quintile
2	38.90763	-77.0627	3rd Quintile
2	38.9102	-77.0294	3rd Quintile
2	38.91334	-77.0374	3rd Quintile
2	38.91336	-77.0497	3rd Quintile
2	38.91112	-77.0349	3rd Quintile
2	38.91599	-77.0702	3rd Quintile
2	38.91184	-77.0405	3rd Quintile
2	38.90624	-77.026	3rd Quintile
2	38.91282	-77.0609	3rd Quintile
2	38.90674	-77.0695	3rd Quintile
2	38.91129	-77.0582	3rd Quintile
2	38.90828	-77.0571	3rd Quintile
2	38.90202	-77.0499	3rd Quintile
2	38.91335	-77.0384	3rd Quintile
2	38.90787	-77.0571	3rd Quintile
2	38.91338	-77.0419	3rd Quintile
2	38.90764	-77.0617	3rd Quintile
2	38.9105	-77.0592	3rd Quintile
2	38.90887	-77.0691	3rd Quintile
2	38.91265	-77.0692	3rd Quintile
2	38.91336	-77.0476	3rd Quintile
2	38.90794	-77.0488	3rd Quintile
2	38.90685	-77.0602	3rd Quintile
2	38.91257	-77.0581	3rd Quintile
2	38.91092	-77.0365	3rd Quintile
2	38.90685	-77.0606	3rd Quintile
2	38.91372	-77.0672	3rd Quintile
2	38.91484	-77.0408	3rd Quintile
2	38.90676	-77.0689	3rd Quintile
2	38.91411	-77.0358	2nd Quintile

2	38.9113	-77.0598	2nd Quintile
2	38.90568	-77.0298	2nd Quintile
2	38.91374	-77.0693	2nd Quintile
2	38.90976	-77.0304	2nd Quintile
2	38.91319	-77.0449	2nd Quintile
2	38.91262	-77.0494	2nd Quintile
2	38.91447	-77.0729	2nd Quintile
2	38.91144	-77.0296	2nd Quintile
2	38.91114	-77.0315	2nd Quintile
2	38.91545	-77.0713	2nd Quintile
2	38.90966	-77.0282	2nd Quintile
2	38.90851	-77.027	2nd Quintile
2	38.9091	-77.0417	2nd Quintile
2	38.91181	-77.0609	2nd Quintile
2	38.91111	-77.0289	2nd Quintile
2	38.9163	-77.0387	2nd Quintile
2	38.90516	-77.0656	2nd Quintile
2	38.91111	-77.0422	2nd Quintile
2	38.91448	-77.0733	2nd Quintile
2	38.91256	-77.0588	2nd Quintile
2	38.91251	-77.0593	2nd Quintile
2	38.91771	-77.0474	2nd Quintile
2	38.90865	-77.0364	2nd Quintile
2	38.91232	-77.0374	2nd Quintile
2	38.90817	-77.027	2nd Quintile
2	38.91463	-77.039	2nd Quintile
2	38.90527	-77.0652	2nd Quintile
2	38.9133	-77.063	2nd Quintile
2	38.91258	-77.0596	2nd Quintile
2	38.91275	-77.0727	2nd Quintile
2	38.9164	-77.0702	2nd Quintile
2	38.91655	-77.0685	2nd Quintile
2	38.90812	-77.0558	2nd Quintile
2	38.9098	-77.0582	2nd Quintile
2	38.91752	-77.048	2nd Quintile
2	38.90868	-77.0296	2nd Quintile
2	38.91538	-77.0735	2nd Quintile
2	38.91115	-77.0409	2nd Quintile
2	38.90854	-77.0565	2nd Quintile
2	38.91338	-77.0422	2nd Quintile
2	38.90988	-77.0592	2nd Quintile
2	38.91572	-77.0743	2nd Quintile
2	38.90847	-77.0606	2nd Quintile
2	38.90939	-77.0561	2nd Quintile
2	38.90788	-77.0581	2nd Quintile
2	38.91286	-77.0434	2nd Quintile
2	38.91158	-77.0593	1st Quintile

2	38.90965	-77.0323	1st Quintile
2	38.9075	-77.0363	1st Quintile
2	38.91267	-77.0601	1st Quintile
2	38.91569	-77.0434	1st Quintile
2	38.91015	-77.03	1st Quintile
2	38.91631	-77.0366	1st Quintile
2	38.91703	-77.0526	1st Quintile
2	38.90858	-77.0465	1st Quintile
2	38.90594	-77.0703	1st Quintile
2	38.90974	-77.0679	1st Quintile
2	38.90585	-77.0661	1st Quintile
2	38.9104	-77.0327	1st Quintile
2	38.90845	-77.0625	1st Quintile
2	38.90818	-77.0364	1st Quintile
2	38.91507	-77.0712	1st Quintile
2	38.90549	-77.0661	1st Quintile
2	38.90963	-77.0271	1st Quintile
2	38.9141	-77.0442	1st Quintile
2	38.91041	-77.0276	1st Quintile
2	38.9138	-77.0668	1st Quintile
2	38.91558	-77.0425	1st Quintile
2	38.9141	-77.0491	1st Quintile
2	38.90217	-77.0496	1st Quintile
2	38.91546	-77.0442	1st Quintile
2	38.9079	-77.0473	1st Quintile
2	38.90714	-77.0581	1st Quintile
2	38.91822	-77.0492	1st Quintile
2	38.91051	-77.0604	1st Quintile
2	38.91114	-77.0386	1st Quintile
2	38.91558	-77.0526	1st Quintile
2	38.90977	-77.067	1st Quintile
2	38.91547	-77.0703	1st Quintile
2	38.91057	-77.0558	1st Quintile
2	38.91698	-77.0393	1st Quintile
2	38.91339	-77.038	1st Quintile
2	38.91484	-77.0401	1st Quintile
2	38.90685	-77.0558	1st Quintile
2	38.91114	-77.0355	1st Quintile
2	38.91369	-77.0687	1st Quintile
2	38.91072	-77.0417	1st Quintile
2	38.90683	-77.0654	1st Quintile
2	38.91071	-77.0687	1st Quintile
2	38.91115	-77.04	1st Quintile
2	38.91486	-77.0515	1st Quintile
2	38.9093	-77.0604	1st Quintile
2	38.91336	-77.0432	1st Quintile
2	38.91343	-77.0635	1st Quintile

2	38.91291	-77.0614	1st Quintile
2	38.9114	-77.0367	1st Quintile
2	38.90685	-77.0586	1st Quintile
2	38.90803	-77.0613	1st Quintile
2	38.91054	-77.0578	1st Quintile
2	38.91488	-77.0349	1st Quintile
2	38.91038	-77.0619	1st Quintile
2	38.90508	-77.0701	1st Quintile
2	38.91019	-77.028	1st Quintile
2	38.91514	-77.0385	1st Quintile
2	38.90848	-77.0558	1st Quintile
2	38.91305	-77.0621	1st Quintile
2	38.90992	-77.0448	1st Quintile
2	38.91412	-77.0515	1st Quintile
2	38.91328	-77.0521	1st Quintile
2	38.90676	-77.045	1st Quintile
2	38.90749	-77.0369	1st Quintile
2	38.91026	-77.0452	1st Quintile
2	38.90936	-77.0466	1st Quintile
2	38.91039	-77.0336	1st Quintile
2	38.90733	-77.0295	1st Quintile
2	38.91333	-77.0367	1st Quintile
2	38.90379	-77.0268	1st Quintile
2	38.9092	-77.0423	1st Quintile
2	38.90725	-77.0482	1st Quintile
2	38.91172	-77.0296	1st Quintile
2	38.90968	-77.0314	1st Quintile
2	38.90772	-77.0242	1st Quintile
2	38.90566	-77.0303	1st Quintile
2	38.91113	-77.0439	1st Quintile
2	38.91188	-77.0311	1st Quintile
2	38.91411	-77.034	1st Quintile
2	38.91188	-77.0321	1st Quintile
2	38.9126	-77.0365	1st Quintile
2	38.90968	-77.0318	1st Quintile
2	38.90302	-77.0296	1st Quintile
2	38.90719	-77.0361	1st Quintile
3	38.95692	-77.071	5th Quintile
3	38.91688	-77.0729	5th Quintile
3	38.93989	-77.102	5th Quintile
3	38.9595	-77.0725	5th Quintile
3	38.94555	-77.076	5th Quintile
3	38.9471	-77.0725	5th Quintile
3	38.93256	-77.0678	5th Quintile
3	38.94322	-77.0664	5th Quintile
3	38.94793	-77.0616	5th Quintile
3	38.91654	-77.0729	5th Quintile

3	38.93026	-77.1003	5th Quintile
3	38.93243	-77.0856	5th Quintile
3	38.94265	-77.0627	5th Quintile
3	38.95903	-77.0747	5th Quintile
3	38.94145	-77.0886	5th Quintile
3	38.92886	-77.0926	5th Quintile
3	38.9187	-77.0584	5th Quintile
3	38.95075	-77.0583	5th Quintile
3	38.93261	-77.0687	5th Quintile
3	38.96493	-77.0753	5th Quintile
3	38.92611	-77.0698	5th Quintile
3	38.93739	-77.0665	5th Quintile
3	38.96982	-77.0702	5th Quintile
3	38.9471	-77.071	5th Quintile
3	38.93029	-77.0884	5th Quintile
3	38.9247	-77.0682	5th Quintile
3	38.92685	-77.0686	5th Quintile
3	38.94822	-77.058	5th Quintile
3	38.92743	-77.077	5th Quintile
3	38.94628	-77.0746	5th Quintile
3	38.94966	-77.0573	5th Quintile
3	38.9658	-77.0758	5th Quintile
3	38.94791	-77.0669	5th Quintile
3	38.96402	-77.0726	5th Quintile
3	38.9448	-77.0776	5th Quintile
3	38.92725	-77.0524	5th Quintile
3	38.92893	-77.0917	5th Quintile
3	38.94063	-77.0968	5th Quintile
3	38.95075	-77.0648	5th Quintile
3	38.93654	-77.1035	5th Quintile
3	38.95593	-77.0772	5th Quintile
3	38.94631	-77.0722	5th Quintile
3	38.95158	-77.0926	5th Quintile
3	38.93869	-77.0932	5th Quintile
3	38.92091	-77.0738	5th Quintile
3	38.93542	-77.0985	5th Quintile
3	38.95585	-77.0663	5th Quintile
3	38.92639	-77.0577	5th Quintile
3	38.95143	-77.0742	5th Quintile
3	38.96232	-77.074	5th Quintile
3	38.96033	-77.0771	5th Quintile
3	38.93853	-77.0664	5th Quintile
3	38.93039	-77.073	5th Quintile
3	38.9432	-77.0691	5th Quintile
3	38.94677	-77.0722	5th Quintile
3	38.94619	-77.0791	5th Quintile
3	38.93135	-77.0886	5th Quintile

3	38.9554	-77.0771	5th Quintile
3	38.92889	-77.0922	5th Quintile
3	38.94457	-77.077	5th Quintile
3	38.93666	-77.0986	5th Quintile
3	38.93418	-77.095	5th Quintile
3	38.94232	-77.0625	5th Quintile
3	38.95469	-77.0818	5th Quintile
3	38.96088	-77.0733	5th Quintile
3	38.92797	-77.0986	5th Quintile
3	38.92363	-77.072	5th Quintile
3	38.94476	-77.0968	5th Quintile
3	38.95338	-77.0926	5th Quintile
3	38.92323	-77.0603	5th Quintile
3	38.9388	-77.0709	5th Quintile
3	38.95187	-77.0616	5th Quintile
3	38.95208	-77.0679	5th Quintile
3	38.92754	-77.0766	5th Quintile
3	38.95595	-77.0902	5th Quintile
3	38.94312	-77.063	5th Quintile
3	38.95854	-77.0701	5th Quintile
3	38.929	-77.0912	5th Quintile
3	38.96762	-77.0722	5th Quintile
3	38.92222	-77.0992	5th Quintile
3	38.93814	-77.0627	5th Quintile
3	38.95471	-77.0808	5th Quintile
3	38.91962	-77.0585	5th Quintile
3	38.95075	-77.0592	5th Quintile
3	38.94289	-77.0928	5th Quintile
3	38.95597	-77.0797	5th Quintile
3	38.94041	-77.0873	5th Quintile
3	38.94325	-77.0933	5th Quintile
3	38.96401	-77.074	5th Quintile
3	38.93243	-77.0861	5th Quintile
3	38.9497	-77.0582	5th Quintile
3	38.93351	-77.0571	5th Quintile
3	38.90965	-77.0814	5th Quintile
3	38.95903	-77.0686	5th Quintile
3	38.93137	-77.085	5th Quintile
3	38.94966	-77.0753	5th Quintile
3	38.93351	-77.0796	5th Quintile
3	38.91917	-77.0787	5th Quintile
3	38.94399	-77.0748	5th Quintile
3	38.93781	-77.099	5th Quintile
3	38.93464	-77.0662	5th Quintile
3	38.96401	-77.0745	5th Quintile
3	38.92799	-77.0536	5th Quintile
3	38.94058	-77.0677	5th Quintile

3	38.93302	-77.0862	5th Quintile
3	38.94366	-77.0746	5th Quintile
3	38.9471	-77.0731	5th Quintile
3	38.93937	-77.0969	5th Quintile
3	38.96405	-77.075	5th Quintile
3	38.95653	-77.0835	5th Quintile
3	38.92602	-77.0517	5th Quintile
3	38.95319	-77.0688	5th Quintile
3	38.95308	-77.0926	4th Quintile
3	38.94855	-77.0558	4th Quintile
3	38.92938	-77.058	4th Quintile
3	38.91984	-77.0567	4th Quintile
3	38.94859	-77.0581	4th Quintile
3	38.96864	-77.072	4th Quintile
3	38.94479	-77.0767	4th Quintile
3	38.95828	-77.0703	4th Quintile
3	38.92922	-77.106	4th Quintile
3	38.94971	-77.0905	4th Quintile
3	38.95904	-77.077	4th Quintile
3	38.96666	-77.0781	4th Quintile
3	38.93345	-77.0709	4th Quintile
3	38.93554	-77.0675	4th Quintile
3	38.96401	-77.0698	4th Quintile
3	38.95663	-77.0708	4th Quintile
3	38.94226	-77.069	4th Quintile
3	38.92456	-77.0782	4th Quintile
3	38.93036	-77.0574	4th Quintile
3	38.91915	-77.0579	4th Quintile
3	38.94581	-77.0712	4th Quintile
3	38.96311	-77.0677	4th Quintile
3	38.92618	-77.0774	4th Quintile
3	38.93098	-77.091	4th Quintile
3	38.95066	-77.0578	4th Quintile
3	38.94879	-77.0671	4th Quintile
3	38.93406	-77.1033	4th Quintile
3	38.95969	-77.0773	4th Quintile
3	38.92753	-77.0849	4th Quintile
3	38.93776	-77.0664	4th Quintile
3	38.92692	-77.0782	4th Quintile
3	38.9649	-77.0803	4th Quintile
3	38.92612	-77.0731	4th Quintile
3	38.93597	-77.099	4th Quintile
3	38.944	-77.0734	4th Quintile
3	38.9185	-77.072	4th Quintile
3	38.96875	-77.0728	4th Quintile
3	38.93851	-77.0712	4th Quintile
3	38.94319	-77.083	4th Quintile

3	38.95372	-77.0838	4th Quintile
3	38.94028	-77.1012	4th Quintile
3	38.91732	-77.0729	4th Quintile
3	38.92476	-77.051	4th Quintile
3	38.92886	-77.0845	4th Quintile
3	38.95175	-77.0596	4th Quintile
3	38.91779	-77.072	4th Quintile
3	38.94629	-77.0727	4th Quintile
3	38.95469	-77.0804	4th Quintile
3	38.9261	-77.0568	4th Quintile
3	38.94971	-77.0815	4th Quintile
3	38.95903	-77.0761	4th Quintile
3	38.92285	-77.0603	4th Quintile
3	38.94479	-77.08	4th Quintile
3	38.94551	-77.0746	4th Quintile
3	38.9631	-77.0699	4th Quintile
3	38.93479	-77.0675	4th Quintile
3	38.94479	-77.0759	4th Quintile
3	38.93295	-77.0664	4th Quintile
3	38.9319	-77.0743	4th Quintile
3	38.95896	-77.0722	4th Quintile
3	38.94915	-77.0548	4th Quintile
3	38.95761	-77.0771	4th Quintile
3	38.94117	-77.0868	4th Quintile
3	38.94882	-77.0757	4th Quintile
3	38.9551	-77.0658	4th Quintile
3	38.94313	-77.0659	4th Quintile
3	38.95399	-77.0695	4th Quintile
3	38.95827	-77.0718	4th Quintile
3	38.91919	-77.0772	4th Quintile
3	38.93349	-77.0686	4th Quintile
3	38.94397	-77.0854	4th Quintile
3	38.95639	-77.0718	4th Quintile
3	38.92807	-77.1047	4th Quintile
3	38.95105	-77.0943	4th Quintile
3	38.95971	-77.0747	4th Quintile
3	38.9292	-77.0862	4th Quintile
3	38.95903	-77.0699	4th Quintile
3	38.95331	-77.0648	4th Quintile
3	38.9237	-77.0709	4th Quintile
3	38.95805	-77.0842	4th Quintile
3	38.91987	-77.0589	4th Quintile
3	38.93242	-77.0878	4th Quintile
3	38.95596	-77.0814	4th Quintile
3	38.93153	-77.0985	4th Quintile
3	38.91654	-77.0707	4th Quintile
3	38.93746	-77.072	4th Quintile

3	38.95406	-77.0803	4th Quintile
3	38.92125	-77.0986	4th Quintile
3	38.95187	-77.0642	4th Quintile
3	38.95332	-77.0945	4th Quintile
3	38.93275	-77.0935	4th Quintile
3	38.91926	-77.073	4th Quintile
3	38.9597	-77.0685	4th Quintile
3	38.92768	-77.0527	4th Quintile
3	38.95473	-77.0926	4th Quintile
3	38.95466	-77.0793	4th Quintile
3	38.95105	-77.0871	4th Quintile
3	38.95185	-77.062	4th Quintile
3	38.95469	-77.0712	4th Quintile
3	38.93817	-77.0711	4th Quintile
3	38.95468	-77.0752	4th Quintile
3	38.95212	-77.0715	4th Quintile
3	38.95842	-77.0771	4th Quintile
3	38.92237	-77.0746	4th Quintile
3	38.92509	-77.0684	4th Quintile
3	38.96763	-77.0764	4th Quintile
3	38.95142	-77.0729	4th Quintile
3	38.92618	-77.077	4th Quintile
3	38.92185	-77.0991	4th Quintile
3	38.9291	-77.0633	4th Quintile
3	38.95986	-77.0727	4th Quintile
3	38.96763	-77.073	4th Quintile
3	38.93633	-77.0663	4th Quintile
3	38.95155	-77.0616	4th Quintile
3	38.93466	-77.0717	4th Quintile
3	38.93514	-77.0675	4th Quintile
3	38.95969	-77.0716	4th Quintile
3	38.93419	-77.0664	4th Quintile
3	38.95206	-77.0602	4th Quintile
3	38.93377	-77.0928	4th Quintile
3	38.92544	-77.0731	4th Quintile
3	38.95276	-77.0887	4th Quintile
3	38.9497	-77.0691	4th Quintile
3	38.92507	-77.0948	3rd Quintile
3	38.95071	-77.0672	3rd Quintile
3	38.93464	-77.0685	3rd Quintile
3	38.94792	-77.0909	3rd Quintile
3	38.9631	-77.073	3rd Quintile
3	38.93841	-77.0621	3rd Quintile
3	38.94563	-77.0643	3rd Quintile
3	38.94233	-77.0746	3rd Quintile
3	38.95596	-77.081	3rd Quintile
3	38.94983	-77.0669	3rd Quintile

3	38.93164	-77.0769	3rd Quintile
3	38.93349	-77.0666	3rd Quintile
3	38.96012	-77.0659	3rd Quintile
3	38.93253	-77.0662	3rd Quintile
3	38.9667	-77.0748	3rd Quintile
3	38.96705	-77.0732	3rd Quintile
3	38.95468	-77.0757	3rd Quintile
3	38.95792	-77.0771	3rd Quintile
3	38.96377	-77.0675	3rd Quintile
3	38.92362	-77.0728	3rd Quintile
3	38.95838	-77.0747	3rd Quintile
3	38.95186	-77.0611	3rd Quintile
3	38.93436	-77.0955	3rd Quintile
3	38.9262	-77.0709	3rd Quintile
3	38.95331	-77.0622	3rd Quintile
3	38.95905	-77.0817	3rd Quintile
3	38.92763	-77.1042	3rd Quintile
3	38.96384	-77.0701	3rd Quintile
3	38.9311	-77.0572	3rd Quintile
3	38.92618	-77.0764	3rd Quintile
3	38.9262	-77.0739	3rd Quintile
3	38.92315	-77.0709	3rd Quintile
3	38.93099	-77.0728	3rd Quintile
3	38.94365	-77.0938	3rd Quintile
3	38.92013	-77.0592	3rd Quintile
3	38.95627	-77.0757	3rd Quintile
3	38.9479	-77.0625	3rd Quintile
3	38.9268	-77.0984	3rd Quintile
3	38.93556	-77.0714	3rd Quintile
3	38.96539	-77.0798	3rd Quintile
3	38.94314	-77.065	3rd Quintile
3	38.95627	-77.0766	3rd Quintile
3	38.94479	-77.0707	3rd Quintile
3	38.94638	-77.0698	3rd Quintile
3	38.96617	-77.0781	3rd Quintile
3	38.93325	-77.0942	3rd Quintile
3	38.93144	-77.057	3rd Quintile
3	38.94207	-77.061	3rd Quintile
3	38.95041	-77.0576	3rd Quintile
3	38.93834	-77.0975	3rd Quintile
3	38.9497	-77.0847	3rd Quintile
3	38.92885	-77.1056	3rd Quintile
3	38.96976	-77.0722	3rd Quintile
3	38.92864	-77.0632	3rd Quintile
3	38.94554	-77.0739	3rd Quintile
3	38.96058	-77.0665	3rd Quintile
3	38.91911	-77.0708	3rd Quintile

3	38.93026	-77.1022	3rd Quintile
3	38.96672	-77.0742	3rd Quintile
3	38.94691	-77.067	3rd Quintile
3	38.9645	-77.0772	3rd Quintile
3	38.92121	-77.0541	3rd Quintile
3	38.92471	-77.0697	3rd Quintile
3	38.92139	-77.0571	3rd Quintile
3	38.9192	-77.0796	3rd Quintile
3	38.92648	-77.1046	3rd Quintile
3	38.93354	-77.0935	3rd Quintile
3	38.94089	-77.0878	3rd Quintile
3	38.93819	-77.0665	3rd Quintile
3	38.9202	-77.0557	3rd Quintile
3	38.96609	-77.0764	3rd Quintile
3	38.93692	-77.0975	3rd Quintile
3	38.9389	-77.092	3rd Quintile
3	38.95469	-77.0826	3rd Quintile
3	38.95627	-77.0752	3rd Quintile
3	38.93452	-77.0964	3rd Quintile
3	38.94479	-77.0713	3rd Quintile
3	38.94629	-77.0734	3rd Quintile
3	38.95836	-77.0794	3rd Quintile
3	38.91846	-77.0587	3rd Quintile
3	38.95214	-77.0616	3rd Quintile
3	38.92678	-77.0847	3rd Quintile
3	38.94416	-77.0926	3rd Quintile
3	38.95702	-77.0887	3rd Quintile
3	38.9325	-77.0934	3rd Quintile
3	38.92369	-77.0614	3rd Quintile
3	38.96689	-77.0768	3rd Quintile
3	38.94338	-77.0746	3rd Quintile
3	38.95972	-77.073	3rd Quintile
3	38.95315	-77.0803	3rd Quintile
3	38.9381	-77.0686	3rd Quintile
3	38.94859	-77.0944	3rd Quintile
3	38.93987	-77.0866	3rd Quintile
3	38.92593	-77.0623	3rd Quintile
3	38.96209	-77.0727	3rd Quintile
3	38.96402	-77.0685	3rd Quintile
3	38.96404	-77.0716	3rd Quintile
3	38.94971	-77.0558	3rd Quintile
3	38.92668	-77.0576	3rd Quintile
3	38.92776	-77.0633	3rd Quintile
3	38.92608	-77.0664	3rd Quintile
3	38.93627	-77.0675	3rd Quintile
3	38.93524	-77.062	3rd Quintile
3	38.96401	-77.0787	3rd Quintile

3	38.94556	-77.0724	3rd Quintile
3	38.95125	-77.0616	3rd Quintile
3	38.92779	-77.0839	3rd Quintile
3	38.96663	-77.0688	3rd Quintile
3	38.93693	-77.0591	3rd Quintile
3	38.95627	-77.0803	3rd Quintile
3	38.92013	-77.0733	3rd Quintile
3	38.94637	-77.0944	3rd Quintile
3	38.95185	-77.0607	3rd Quintile
3	38.94702	-77.0652	3rd Quintile
3	38.96313	-77.0772	3rd Quintile
3	38.94641	-77.0719	3rd Quintile
3	38.96582	-77.0749	3rd Quintile
3	38.92879	-77.0575	3rd Quintile
3	38.95837	-77.0738	3rd Quintile
3	38.91868	-77.0717	3rd Quintile
3	38.95076	-77.0555	3rd Quintile
3	38.93216	-77.078	3rd Quintile
3	38.9125	-77.0815	3rd Quintile
3	38.95132	-77.0602	3rd Quintile
3	38.94631	-77.0817	3rd Quintile
3	38.95843	-77.0845	3rd Quintile
3	38.92681	-77.0758	3rd Quintile
3	38.95048	-77.0541	3rd Quintile
3	38.93557	-77.0727	3rd Quintile
3	38.91916	-77.0881	3rd Quintile
3	38.92867	-77.0849	3rd Quintile
3	38.95616	-77.072	2nd Quintile
3	38.95688	-77.0803	2nd Quintile
3	38.94519	-77.0558	2nd Quintile
3	38.94967	-77.0804	2nd Quintile
3	38.93138	-77.0856	2nd Quintile
3	38.93315	-77.074	2nd Quintile
3	38.92981	-77.0886	2nd Quintile
3	38.93336	-77.0862	2nd Quintile
3	38.95597	-77.0872	2nd Quintile
3	38.95626	-77.0748	2nd Quintile
3	38.92173	-77.0756	2nd Quintile
3	38.93351	-77.0772	2nd Quintile
3	38.9275	-77.0688	2nd Quintile
3	38.95805	-77.0812	2nd Quintile
3	38.95904	-77.0682	2nd Quintile
3	38.93704	-77.0724	2nd Quintile
3	38.96077	-77.0771	2nd Quintile
3	38.92817	-77.0842	2nd Quintile
3	38.94378	-77.0926	2nd Quintile
3	38.95109	-77.0604	2nd Quintile

3	38.94967	-77.0586	2nd Quintile
3	38.92077	-77.0747	2nd Quintile
3	38.92619	-77.0743	2nd Quintile
3	38.95345	-77.069	2nd Quintile
3	38.92807	-77.0633	2nd Quintile
3	38.96176	-77.0696	2nd Quintile
3	38.9634	-77.07	2nd Quintile
3	38.96209	-77.0758	2nd Quintile
3	38.95448	-77.0885	2nd Quintile
3	38.93332	-77.0946	2nd Quintile
3	38.95707	-77.0838	2nd Quintile
3	38.92667	-77.0636	2nd Quintile
3	38.95105	-77.0841	2nd Quintile
3	38.9265	-77.077	2nd Quintile
3	38.93288	-77.0771	2nd Quintile
3	38.92621	-77.0717	2nd Quintile
3	38.9335	-77.0777	2nd Quintile
3	38.9517	-77.06	2nd Quintile
3	38.92447	-77.0508	2nd Quintile
3	38.9631	-77.0738	2nd Quintile
3	38.954	-77.0715	2nd Quintile
3	38.93934	-77.0932	2nd Quintile
3	38.93585	-77.0675	2nd Quintile
3	38.94319	-77.0837	2nd Quintile
3	38.93188	-77.0886	2nd Quintile
3	38.94631	-77.0739	2nd Quintile
3	38.94924	-77.0583	2nd Quintile
3	38.96467	-77.0794	2nd Quintile
3	38.94129	-77.0968	2nd Quintile
3	38.95828	-77.0838	2nd Quintile
3	38.95704	-77.0716	2nd Quintile
3	38.92081	-77.0968	2nd Quintile
3	38.94758	-77.0669	2nd Quintile
3	38.95592	-77.0803	2nd Quintile
3	38.9597	-77.0681	2nd Quintile
3	38.93949	-77.0861	2nd Quintile
3	38.94129	-77.0889	2nd Quintile
3	38.94966	-77.0604	2nd Quintile
3	38.92755	-77.0861	2nd Quintile
3	38.93563	-77.1059	2nd Quintile
3	38.96434	-77.0797	2nd Quintile
3	38.95468	-77.085	2nd Quintile
3	38.92256	-77.0773	2nd Quintile
3	38.91758	-77.0967	2nd Quintile
3	38.92684	-77.0731	2nd Quintile
3	38.92753	-77.076	2nd Quintile
3	38.93745	-77.0953	2nd Quintile

3	38.93496	-77.1087	2nd Quintile
3	38.93356	-77.0973	2nd Quintile
3	38.92743	-77.0553	2nd Quintile
3	38.94312	-77.0676	2nd Quintile
3	38.96438	-77.0678	2nd Quintile
3	38.92474	-77.0731	2nd Quintile
3	38.95458	-77.0838	2nd Quintile
3	38.92045	-77.0735	2nd Quintile
3	38.97045	-77.0707	2nd Quintile
3	38.95195	-77.0661	2nd Quintile
3	38.96311	-77.0705	2nd Quintile
3	38.96402	-77.0798	2nd Quintile
3	38.95569	-77.0724	2nd Quintile
3	38.96491	-77.0772	2nd Quintile
3	38.92712	-77.0632	2nd Quintile
3	38.95758	-77.0714	2nd Quintile
3	38.96582	-77.0753	2nd Quintile
3	38.96208	-77.0718	2nd Quintile
3	38.96762	-77.0735	2nd Quintile
3	38.944	-77.0742	2nd Quintile
3	38.96643	-77.0764	2nd Quintile
3	38.95836	-77.0755	2nd Quintile
3	38.91518	-77.0912	2nd Quintile
3	38.92621	-77.0746	2nd Quintile
3	38.96584	-77.0725	2nd Quintile
3	38.92472	-77.0951	2nd Quintile
3	38.95627	-77.076	2nd Quintile
3	38.92069	-77.0756	2nd Quintile
3	38.96762	-77.0748	2nd Quintile
3	38.92909	-77.0838	2nd Quintile
3	38.95762	-77.0691	2nd Quintile
3	38.9537	-77.0795	2nd Quintile
3	38.93012	-77.0887	2nd Quintile
3	38.95239	-77.0887	2nd Quintile
3	38.95203	-77.0944	2nd Quintile
3	38.95619	-77.0704	2nd Quintile
3	38.93741	-77.1019	2nd Quintile
3	38.95661	-77.0664	2nd Quintile
3	38.93128	-77.1075	2nd Quintile
3	38.96304	-77.0672	2nd Quintile
3	38.9631	-77.0734	2nd Quintile
3	38.95145	-77.084	2nd Quintile
3	38.9407	-77.1008	2nd Quintile
3	38.95902	-77.0756	2nd Quintile
3	38.93142	-77.0663	2nd Quintile
3	38.92331	-77.0731	2nd Quintile
3	38.95469	-77.089	2nd Quintile

3	38.92894	-77.0579	2nd Quintile
3	38.92439	-77.0672	2nd Quintile
3	38.92825	-77.0576	2nd Quintile
3	38.95759	-77.0841	2nd Quintile
3	38.93027	-77.0902	2nd Quintile
3	38.92411	-77.0732	2nd Quintile
3	38.94555	-77.0777	2nd Quintile
3	38.9282	-77.0886	1st Quintile
3	38.9403	-77.0979	1st Quintile
3	38.94192	-77.0988	1st Quintile
3	38.95142	-77.0724	1st Quintile
3	38.95743	-77.0667	1st Quintile
3	38.91945	-77.0922	1st Quintile
3	38.9317	-77.0687	1st Quintile
3	38.92788	-77.053	1st Quintile
3	38.93465	-77.0669	1st Quintile
3	38.95143	-77.0712	1st Quintile
3	38.94812	-77.0944	1st Quintile
3	38.918	-77.0729	1st Quintile
3	38.94791	-77.0998	1st Quintile
3	38.93899	-77.0667	1st Quintile
3	38.94965	-77.0862	1st Quintile
3	38.94791	-77.0949	1st Quintile
3	38.96865	-77.0711	1st Quintile
3	38.9597	-77.0707	1st Quintile
3	38.92476	-77.092	1st Quintile
3	38.91922	-77.0984	1st Quintile
3	38.92644	-77.0686	1st Quintile
3	38.96587	-77.0792	1st Quintile
3	38.91901	-77.0738	1st Quintile
3	38.96231	-77.0803	1st Quintile
3	38.92716	-77.0686	1st Quintile
3	38.93692	-77.1011	1st Quintile
3	38.94397	-77.0909	1st Quintile
3	38.91983	-77.0741	1st Quintile
3	38.95836	-77.0783	1st Quintile
3	38.91701	-77.0733	1st Quintile
3	38.94223	-77.0966	1st Quintile
3	38.92988	-77.1072	1st Quintile
3	38.91108	-77.0813	1st Quintile
3	38.92991	-77.1067	1st Quintile
3	38.95444	-77.0824	1st Quintile
3	38.94126	-77.099	1st Quintile
3	38.92241	-77.0987	1st Quintile
3	38.94656	-77.0674	1st Quintile
3	38.95598	-77.0867	1st Quintile
3	38.93069	-77.107	1st Quintile

3	38.92948	-77.0658	1st Quintile
3	38.95333	-77.0938	1st Quintile
3	38.96266	-77.0803	1st Quintile
3	38.94451	-77.0724	1st Quintile
3	38.94673	-77.0651	1st Quintile
3	38.96401	-77.0792	1st Quintile
3	38.93465	-77.0681	1st Quintile
3	38.95526	-77.0803	1st Quintile
3	38.9597	-77.0759	1st Quintile
3	38.92132	-77.0731	1st Quintile
3	38.94556	-77.0838	1st Quintile
3	38.93031	-77.1014	1st Quintile
3	38.9621	-77.0752	1st Quintile
3	38.92677	-77.1018	1st Quintile
3	38.95591	-77.0887	1st Quintile
3	38.93026	-77.0872	1st Quintile
3	38.91919	-77.0964	1st Quintile
3	38.9488	-77.0687	1st Quintile
3	38.96583	-77.0783	1st Quintile
3	38.94631	-77.0821	1st Quintile
3	38.92854	-77.0886	1st Quintile
3	38.95549	-77.0732	1st Quintile
3	38.91934	-77.0574	1st Quintile
3	38.93021	-77.0613	1st Quintile
3	38.95704	-77.0772	1st Quintile
3	38.92438	-77.1023	1st Quintile
3	38.94185	-77.0545	1st Quintile
3	38.94479	-77.0812	1st Quintile
3	38.94478	-77.0905	1st Quintile
3	38.93243	-77.089	1st Quintile
3	38.94314	-77.0926	1st Quintile
3	38.95473	-77.0865	1st Quintile
3	38.9303	-77.1069	1st Quintile
3	38.91921	-77.0943	1st Quintile
3	38.92129	-77.074	1st Quintile
3	38.9491	-77.0802	1st Quintile
3	38.94631	-77.0952	1st Quintile
3	38.93028	-77.0876	1st Quintile
3	38.93403	-77.0576	1st Quintile
3	38.92564	-77.0515	1st Quintile
3	38.92888	-77.0875	1st Quintile
3	38.93781	-77.0717	1st Quintile
3	38.95104	-77.0863	1st Quintile
3	38.92956	-77.0838	1st Quintile
3	38.92655	-77.052	1st Quintile
3	38.91977	-77.0956	1st Quintile
3	38.93242	-77.0896	1st Quintile

3	38.92886	-77.0869	1st Quintile
3	38.94735	-77.0886	1st Quintile
3	38.9283	-77.0551	1st Quintile
3	38.94399	-77.0849	1st Quintile
3	38.93136	-77.0879	1st Quintile
3	38.942	-77.0878	1st Quintile
3	38.94138	-77.07	1st Quintile
3	38.95212	-77.087	1st Quintile
3	38.95235	-77.085	1st Quintile
3	38.9076	-77.0816	1st Quintile
3	38.94873	-77.0968	1st Quintile
3	38.92725	-77.1038	1st Quintile
3	38.91734	-77.0964	1st Quintile
3	38.91985	-77.0922	1st Quintile
3	38.9512	-77.0837	1st Quintile
3	38.92495	-77.0945	1st Quintile
3	38.92482	-77.062	1st Quintile
3	38.92818	-77.099	1st Quintile
3	38.94213	-77.0542	1st Quintile
3	38.94789	-77.0578	1st Quintile
3	38.93142	-77.1083	1st Quintile
4	38.98833	-77.0354	5th Quintile
4	38.97842	-77.0334	5th Quintile
4	38.95988	-77.0245	5th Quintile
4	38.94456	-77.0193	5th Quintile
4	38.93974	-77.0297	5th Quintile
4	38.9506	-77.0349	5th Quintile
4	38.96675	-77.0639	5th Quintile
4	38.97128	-77.0117	5th Quintile
4	38.98795	-77.0345	5th Quintile
4	38.96756	-77.0297	5th Quintile
4	38.96979	-77.0561	5th Quintile
4	38.95333	-77.0141	5th Quintile
4	38.95006	-77.0163	5th Quintile
4	38.95929	-77.0588	5th Quintile
4	38.96505	-77.0137	5th Quintile
4	38.95745	-77.0258	5th Quintile
4	38.98835	-77.0375	5th Quintile
4	38.95685	-77.0258	5th Quintile
4	38.96931	-77.0689	5th Quintile
4	38.98735	-77.0399	5th Quintile
4	38.95973	-77.0241	5th Quintile
4	38.96712	-77.036	5th Quintile
4	38.96123	-77.0286	5th Quintile
4	38.94837	-77.022	5th Quintile
4	38.96044	-77.0297	5th Quintile
4	38.97188	-77.0573	5th Quintile

4	38.94189	-77.0322	5th Quintile
4	38.9443	-77.0161	5th Quintile
4	38.96993	-77.0242	5th Quintile
4	38.95003	-77.0168	5th Quintile
4	38.98611	-77.0389	5th Quintile
4	38.96823	-77.0105	5th Quintile
4	38.94918	-77.0209	5th Quintile
4	38.96725	-77.026	5th Quintile
4	38.96612	-77.0179	5th Quintile
4	38.95953	-77.0235	5th Quintile
4	38.9592	-77.0224	5th Quintile
4	38.95662	-77.0076	5th Quintile
4	38.95178	-77.0346	5th Quintile
4	38.96598	-77.059	5th Quintile
4	38.96059	-77.0267	5th Quintile
4	38.96104	-77.0585	5th Quintile
4	38.99132	-77.0379	5th Quintile
4	38.96581	-77.0678	5th Quintile
4	38.98723	-77.0416	5th Quintile
4	38.96998	-77.0142	5th Quintile
4	38.98549	-77.0355	5th Quintile
4	38.95938	-77.023	5th Quintile
4	38.97474	-77.0139	5th Quintile
4	38.95876	-77.0169	5th Quintile
4	38.94081	-77.0297	5th Quintile
4	38.97173	-77.0614	5th Quintile
4	38.95981	-77.0642	5th Quintile
4	38.96093	-77.0366	5th Quintile
4	38.94639	-77.0176	5th Quintile
4	38.96492	-77.0199	5th Quintile
4	38.98037	-77.0357	5th Quintile
4	38.96551	-77.026	5th Quintile
4	38.95844	-76.9964	5th Quintile
4	38.97869	-77.0351	5th Quintile
4	38.95682	-77.0116	5th Quintile
4	38.95713	-77.0241	5th Quintile
4	38.9612	-77.0575	5th Quintile
4	38.94189	-77.0216	5th Quintile
4	38.96693	-77.0593	5th Quintile
4	38.96532	-77.0162	5th Quintile
4	38.98571	-77.0404	5th Quintile
4	38.9599	-76.9968	5th Quintile
4	38.94614	-77.0262	5th Quintile
4	38.96417	-77.0136	5th Quintile
4	38.97283	-77.0699	5th Quintile
4	38.96864	-77.0694	5th Quintile
4	38.95084	-77.0193	5th Quintile

4	38.94719	-77.0278	5th Quintile
4	38.9638	-77.0222	5th Quintile
4	38.96977	-77.0614	5th Quintile
4	38.96976	-77.0657	5th Quintile
4	38.97359	-77.0628	5th Quintile
4	38.95874	-77.0161	5th Quintile
4	38.97284	-77.062	5th Quintile
4	38.99102	-77.038	5th Quintile
4	38.95079	-77.0281	5th Quintile
4	38.96001	-77.0297	5th Quintile
4	38.94996	-77.0175	5th Quintile
4	38.96001	-77.0575	5th Quintile
4	38.93886	-77.0282	5th Quintile
4	38.97246	-77.0154	5th Quintile
4	38.9533	-77.0297	5th Quintile
4	38.95184	-77.032	5th Quintile
4	38.96271	-77.0201	5th Quintile
4	38.94622	-77.0194	5th Quintile
4	38.9627	-77.0122	5th Quintile
4	38.95665	-77.0136	5th Quintile
4	38.96197	-77.0287	5th Quintile
4	38.96998	-77.0617	5th Quintile
4	38.93761	-77.0261	5th Quintile
4	38.9794	-77.0288	5th Quintile
4	38.95146	-77.0276	5th Quintile
4	38.97035	-77.0334	5th Quintile
4	38.95164	-77.0221	5th Quintile
4	38.99063	-77.0456	5th Quintile
4	38.95823	-76.9941	5th Quintile
4	38.95031	-77.022	5th Quintile
4	38.95007	-77.0158	5th Quintile
4	38.94187	-77.0313	5th Quintile
4	38.97079	-77.0651	5th Quintile
4	38.96495	-77.0147	5th Quintile
4	38.96274	-76.9986	5th Quintile
4	38.9444	-77.012	5th Quintile
4	38.94742	-77.0184	5th Quintile
4	38.96035	-77.0048	5th Quintile
4	38.96107	-77.0565	5th Quintile
4	38.95559	-77.013	5th Quintile
4	38.96495	-77.0629	5th Quintile
4	38.95865	-77.018	5th Quintile
4	38.96615	-77.0226	5th Quintile
4	38.94078	-77.0468	5th Quintile
4	38.95199	-77.0227	5th Quintile
4	38.9704	-77.0558	5th Quintile
4	38.97872	-77.0279	5th Quintile

4	38.96977	-77.0691	5th Quintile
4	38.98811	-77.0378	5th Quintile
4	38.94827	-77.0306	5th Quintile
4	38.98335	-77.0334	5th Quintile
4	38.96106	-77.058	5th Quintile
4	38.99216	-77.0386	5th Quintile
4	38.96052	-77.0036	5th Quintile
4	38.95425	-77.0262	5th Quintile
4	38.94905	-77.0253	5th Quintile
4	38.98116	-77.0387	5th Quintile
4	38.95856	-77.0208	5th Quintile
4	38.95682	-76.9996	5th Quintile
4	38.96815	-77.0613	5th Quintile
4	38.988	-77.0382	5th Quintile
4	38.96496	-77.0164	5th Quintile
4	38.96601	-77.0572	5th Quintile
4	38.97388	-77.0144	5th Quintile
4	38.94831	-77.0249	5th Quintile
4	38.96681	-77.0612	5th Quintile
4	38.97582	-77.0263	5th Quintile
4	38.94311	-77.014	5th Quintile
4	38.98459	-77.0302	5th Quintile
4	38.9673	-77.0586	4th Quintile
4	38.97262	-77.0602	4th Quintile
4	38.96091	-77.0274	4th Quintile
4	38.98603	-77.0396	4th Quintile
4	38.96978	-77.0624	4th Quintile
4	38.94593	-77.0297	4th Quintile
4	38.97228	-77.0588	4th Quintile
4	38.96305	-77.0562	4th Quintile
4	38.95112	-77.0167	4th Quintile
4	38.98724	-77.0403	4th Quintile
4	38.95922	-77.0244	4th Quintile
4	38.97052	-77.0561	4th Quintile
4	38.95405	-77.0352	4th Quintile
4	38.96818	-77.0113	4th Quintile
4	38.98322	-77.0369	4th Quintile
4	38.9498	-77.0245	4th Quintile
4	38.94507	-77.0265	4th Quintile
4	38.94535	-77.0327	4th Quintile
4	38.98387	-77.0334	4th Quintile
4	38.94829	-77.0257	4th Quintile
4	38.98647	-77.039	4th Quintile
4	38.95626	-77.0277	4th Quintile
4	38.94507	-77.041	4th Quintile
4	38.96089	-77.0279	4th Quintile
4	38.98909	-77.0425	4th Quintile

4	38.9871	-77.0407	4th Quintile
4	38.98804	-77.0348	4th Quintile
4	38.97208	-77.0609	4th Quintile
4	38.94818	-77.0237	4th Quintile
4	38.98377	-77.0297	4th Quintile
4	38.97364	-77.0605	4th Quintile
4	38.94627	-77.0225	4th Quintile
4	38.96332	-77.0664	4th Quintile
4	38.97211	-77.0624	4th Quintile
4	38.98152	-77.0297	4th Quintile
4	38.96455	-77.0664	4th Quintile
4	38.98689	-77.0397	4th Quintile
4	38.9659	-77.062	4th Quintile
4	38.95075	-77.0238	4th Quintile
4	38.93703	-77.0295	4th Quintile
4	38.96578	-77.0225	4th Quintile
4	38.94188	-77.04	4th Quintile
4	38.97405	-77.0664	4th Quintile
4	38.96378	-77.0639	4th Quintile
4	38.9724	-77.0605	4th Quintile
4	38.98655	-77.0397	4th Quintile
4	38.96497	-77.0182	4th Quintile
4	38.96451	-77.0632	4th Quintile
4	38.9642	-77.0635	4th Quintile
4	38.95218	-77.0159	4th Quintile
4	38.97126	-77.058	4th Quintile
4	38.98599	-77.0381	4th Quintile
4	38.98227	-77.057	4th Quintile
4	38.95843	-77.0224	4th Quintile
4	38.97241	-77.0141	4th Quintile
4	38.93713	-77.0253	4th Quintile
4	38.99149	-77.0374	4th Quintile
4	38.9888	-77.032	4th Quintile
4	38.96762	-77.0656	4th Quintile
4	38.98585	-77.0372	4th Quintile
4	38.94332	-77.0327	4th Quintile
4	38.95902	-77.0219	4th Quintile
4	38.94614	-77.0328	4th Quintile
4	38.97386	-77.061	4th Quintile
4	38.97582	-77.0214	4th Quintile
4	38.93997	-77.0174	4th Quintile
4	38.94701	-77.0236	4th Quintile
4	38.96404	-77.0676	4th Quintile
4	38.99188	-77.0383	4th Quintile
4	38.9529	-77.0335	4th Quintile
4	38.94717	-77.0195	4th Quintile
4	38.9742	-77.0686	4th Quintile

4	38.98768	-77.0418	4th Quintile
4	38.96688	-77.0114	4th Quintile
4	38.98785	-77.0338	4th Quintile
4	38.98322	-77.034	4th Quintile
4	38.94045	-77.0162	4th Quintile
4	38.95956	-77.0575	4th Quintile
4	38.97869	-77.0312	4th Quintile
4	38.94675	-77.0215	4th Quintile
4	38.9881	-77.041	4th Quintile
4	38.96976	-77.0665	4th Quintile
4	38.96721	-77.0609	4th Quintile
4	38.96672	-77.0648	4th Quintile
4	38.99163	-77.0381	4th Quintile
4	38.95934	-77.0001	4th Quintile
4	38.97206	-77.059	4th Quintile
4	38.96137	-77.0659	4th Quintile
4	38.96462	-77.0087	4th Quintile
4	38.95189	-77.0305	4th Quintile
4	38.96105	-77.0661	4th Quintile
4	38.93914	-77.0249	4th Quintile
4	38.94852	-77.0185	4th Quintile
4	38.94973	-77.0274	4th Quintile
4	38.95224	-77.0149	4th Quintile
4	38.97122	-77.0712	4th Quintile
4	38.94187	-77.0318	4th Quintile
4	38.94814	-77.0157	4th Quintile
4	38.97146	-77.0151	4th Quintile
4	38.94559	-77.0297	4th Quintile
4	38.97237	-77.0256	4th Quintile
4	38.94841	-77.0209	4th Quintile
4	38.96684	-77.0301	4th Quintile
4	38.987	-77.0411	4th Quintile
4	38.96974	-77.062	4th Quintile
4	38.96642	-77.0581	4th Quintile
4	38.96631	-77.009	4th Quintile
4	38.95652	-77.0258	4th Quintile
4	38.96762	-77.0663	4th Quintile
4	38.98783	-77.039	4th Quintile
4	38.94083	-77.0209	4th Quintile
4	38.95516	-77.0282	4th Quintile
4	38.9509	-77.0232	4th Quintile
4	38.97202	-77.0636	4th Quintile
4	38.96978	-77.0674	4th Quintile
4	38.9663	-77.026	4th Quintile
4	38.98705	-77.0349	4th Quintile
4	38.98843	-77.0406	4th Quintile
4	38.94844	-77.0226	4th Quintile

4	38.96571	-77.0576	4th Quintile
4	38.98474	-77.0311	4th Quintile
4	38.94939	-77.0196	4th Quintile
4	38.9478	-77.0174	4th Quintile
4	38.95688	-77.0223	4th Quintile
4	38.961	-76.998	4th Quintile
4	38.9405	-77.0211	4th Quintile
4	38.95679	-77.0148	4th Quintile
4	38.96978	-77.0552	4th Quintile
4	38.96822	-77.0109	4th Quintile
4	38.98785	-77.0415	4th Quintile
4	38.97285	-77.0694	4th Quintile
4	38.96073	-77.0575	4th Quintile
4	38.98094	-77.0584	4th Quintile
4	38.96064	-77.028	4th Quintile
4	38.9823	-77.0362	4th Quintile
4	38.97038	-77.0285	4th Quintile
4	38.98869	-77.0383	4th Quintile
4	38.94507	-77.0326	4th Quintile
4	38.94001	-77.0169	4th Quintile
4	38.94623	-77.0229	3rd Quintile
4	38.96071	-76.9977	3rd Quintile
4	38.93867	-77.0285	3rd Quintile
4	38.98741	-77.0366	3rd Quintile
4	38.98747	-77.0331	3rd Quintile
4	38.94842	-77.027	3rd Quintile
4	38.95837	-77.0201	3rd Quintile
4	38.95842	-77.0577	3rd Quintile
4	38.99224	-77.0379	3rd Quintile
4	38.96508	-77.0225	3rd Quintile
4	38.96701	-77.0276	3rd Quintile
4	38.93989	-77.0202	3rd Quintile
4	38.97285	-77.0671	3rd Quintile
4	38.94464	-77.0218	3rd Quintile
4	38.94713	-77.0269	3rd Quintile
4	38.98912	-77.0407	3rd Quintile
4	38.9675	-77.0556	3rd Quintile
4	38.96387	-77.0137	3rd Quintile
4	38.96584	-77.0682	3rd Quintile
4	38.95543	-77.0185	3rd Quintile
4	38.96978	-77.0604	3rd Quintile
4	38.96978	-77.0575	3rd Quintile
4	38.96977	-77.0682	3rd Quintile
4	38.96583	-77.0625	3rd Quintile
4	38.98984	-77.04	3rd Quintile
4	38.95767	-77.0117	3rd Quintile
4	38.9662	-77.0617	3rd Quintile

4	38.97973	-77.0245	3rd Quintile
4	38.98799	-77.0426	3rd Quintile
4	38.9685	-77.0573	3rd Quintile
4	38.97875	-77.0297	3rd Quintile
4	38.98489	-77.0324	3rd Quintile
4	38.98832	-77.0428	3rd Quintile
4	38.9899	-77.0434	3rd Quintile
4	38.94836	-77.023	3rd Quintile
4	38.94084	-77.0424	3rd Quintile
4	38.97224	-77.013	3rd Quintile
4	38.94189	-77.0262	3rd Quintile
4	38.96413	-77.0625	3rd Quintile
4	38.94679	-77.0194	3rd Quintile
4	38.98912	-77.0397	3rd Quintile
4	38.94089	-77.0472	3rd Quintile
4	38.97285	-77.015	3rd Quintile
4	38.97539	-77.0582	3rd Quintile
4	38.96817	-77.0552	3rd Quintile
4	38.94982	-77.0238	3rd Quintile
4	38.96322	-77.0333	3rd Quintile
4	38.9654	-77.0225	3rd Quintile
4	38.97201	-77.0713	3rd Quintile
4	38.96768	-77.0355	3rd Quintile
4	38.97112	-77.0621	3rd Quintile
4	38.99023	-77.0432	3rd Quintile
4	38.93869	-77.0273	3rd Quintile
4	38.98927	-77.0432	3rd Quintile
4	38.98884	-77.0398	3rd Quintile
4	38.9401	-77.0297	3rd Quintile
4	38.94566	-77.0265	3rd Quintile
4	38.9525	-77.0346	3rd Quintile
4	38.96614	-77.0331	3rd Quintile
4	38.98893	-77.0429	3rd Quintile
4	38.99259	-77.0409	3rd Quintile
4	38.98946	-77.042	3rd Quintile
4	38.98755	-77.0423	3rd Quintile
4	38.96999	-77.0537	3rd Quintile
4	38.94315	-77.0259	3rd Quintile
4	38.96646	-77.0615	3rd Quintile
4	38.94235	-77.0217	3rd Quintile
4	38.9698	-77.0697	3rd Quintile
4	38.96566	-77.0622	3rd Quintile
4	38.96977	-77.0644	3rd Quintile
4	38.94507	-77.0335	3rd Quintile
4	38.98996	-77.0414	3rd Quintile
4	38.96741	-77.0546	3rd Quintile
4	38.97033	-77.0549	3rd Quintile

4	38.99071	-77.0388	3rd Quintile
4	38.97175	-77.0716	3rd Quintile
4	38.98136	-77.0356	3rd Quintile
4	38.98865	-77.0393	3rd Quintile
4	38.9704	-77.0536	3rd Quintile
4	38.95663	-77.0089	3rd Quintile
4	38.96874	-77.0538	3rd Quintile
4	38.96274	-77.0161	3rd Quintile
4	38.97067	-77.0335	3rd Quintile
4	38.95824	-77.0116	3rd Quintile
4	38.96562	-77.0565	3rd Quintile
4	38.96391	-77.0664	3rd Quintile
4	38.96286	-77.0664	3rd Quintile
4	38.96496	-77.0228	3rd Quintile
4	38.94913	-77.0271	3rd Quintile
4	38.96896	-77.009	3rd Quintile
4	38.97943	-77.0361	3rd Quintile
4	38.99089	-77.0353	3rd Quintile
4	38.9842	-77.0365	3rd Quintile
4	38.98565	-77.0364	3rd Quintile
4	38.95146	-77.023	3rd Quintile
4	38.96583	-77.063	3rd Quintile
4	38.96017	-77.0252	3rd Quintile
4	38.9815	-77.0334	3rd Quintile
4	38.94831	-77.0301	3rd Quintile
4	38.95392	-77.0177	3rd Quintile
4	38.97207	-77.0697	3rd Quintile
4	38.96864	-77.0653	3rd Quintile
4	38.94303	-77.023	3rd Quintile
4	38.98183	-77.0291	3rd Quintile
4	38.95928	-77.0359	3rd Quintile
4	38.96866	-77.016	3rd Quintile
4	38.98936	-77.0393	3rd Quintile
4	38.98658	-77.0364	3rd Quintile
4	38.97936	-77.0317	3rd Quintile
4	38.94806	-77.027	3rd Quintile
4	38.95415	-77.0272	3rd Quintile
4	38.94425	-77.0176	3rd Quintile
4	38.96584	-77.0663	3rd Quintile
4	38.9627	-77.0137	3rd Quintile
4	38.97387	-77.0616	3rd Quintile
4	38.96899	-77.0291	3rd Quintile
4	38.9661	-77.0162	3rd Quintile
4	38.95124	-77.0347	3rd Quintile
4	38.99261	-77.039	3rd Quintile
4	38.95352	-77.035	3rd Quintile
4	38.98217	-77.0379	3rd Quintile

4	38.93873	-77.0327	3rd Quintile
4	38.97285	-77.0689	3rd Quintile
4	38.96271	-77.028	3rd Quintile
4	38.98021	-77.0245	3rd Quintile
4	38.97207	-77.0686	3rd Quintile
4	38.96735	-77.0137	3rd Quintile
4	38.94024	-77.0213	3rd Quintile
4	38.97581	-77.0202	3rd Quintile
4	38.94903	-77.0262	3rd Quintile
4	38.97082	-77.0575	3rd Quintile
4	38.95609	-77.0335	3rd Quintile
4	38.94397	-77.0235	3rd Quintile
4	38.96674	-77.0652	3rd Quintile
4	38.94723	-77.0251	3rd Quintile
4	38.97148	-77.0598	3rd Quintile
4	38.93882	-77.0201	3rd Quintile
4	38.95874	-77.019	3rd Quintile
4	38.95837	-77.0177	3rd Quintile
4	38.98119	-77.0285	3rd Quintile
4	38.94189	-77.0397	3rd Quintile
4	38.96882	-77.0561	3rd Quintile
4	38.95151	-77.0297	3rd Quintile
4	38.9731	-77.0611	3rd Quintile
4	38.96614	-77.0327	3rd Quintile
4	38.95968	-76.9965	3rd Quintile
4	38.94846	-77.0174	3rd Quintile
4	38.94085	-77.0431	2nd Quintile
4	38.96685	-77.0363	2nd Quintile
4	38.95767	-77.0093	2nd Quintile
4	38.96376	-77.0226	2nd Quintile
4	38.95741	-77.0003	2nd Quintile
4	38.96993	-77.0331	2nd Quintile
4	38.95276	-77.0297	2nd Quintile
4	38.98272	-77.0279	2nd Quintile
4	38.97172	-77.0634	2nd Quintile
4	38.94056	-77.0252	2nd Quintile
4	38.94613	-77.0313	2nd Quintile
4	38.98117	-77.0295	2nd Quintile
4	38.94989	-77.0215	2nd Quintile
4	38.97717	-77.0339	2nd Quintile
4	38.93834	-77.0227	2nd Quintile
4	38.97945	-77.0335	2nd Quintile
4	38.93762	-77.0297	2nd Quintile
4	38.9519	-77.0277	2nd Quintile
4	38.95542	-77.0257	2nd Quintile
4	38.98039	-77.0324	2nd Quintile
4	38.95662	-77.0124	2nd Quintile

4	38.96865	-77.067	2nd Quintile
4	38.96864	-77.0657	2nd Quintile
4	38.95081	-77.0352	2nd Quintile
4	38.97015	-77.0623	2nd Quintile
4	38.94042	-77.0297	2nd Quintile
4	38.9855	-77.0311	2nd Quintile
4	38.94443	-77.0262	2nd Quintile
4	38.95901	-76.9954	2nd Quintile
4	38.93975	-77.0324	2nd Quintile
4	38.9702	-77.0117	2nd Quintile
4	38.98497	-77.0286	2nd Quintile
4	38.959	-77.0648	2nd Quintile
4	38.96788	-77.0124	2nd Quintile
4	38.96751	-77.0334	2nd Quintile
4	38.97941	-77.0273	2nd Quintile
4	38.95331	-77.0117	2nd Quintile
4	38.9627	-77.0116	2nd Quintile
4	38.96273	-77.0626	2nd Quintile
4	38.98431	-77.0372	2nd Quintile
4	38.95929	-77.0336	2nd Quintile
4	38.95682	-77.0335	2nd Quintile
4	38.97942	-77.0244	2nd Quintile
4	38.94984	-77.0231	2nd Quintile
4	38.95857	-76.9948	2nd Quintile
4	38.95056	-77.0195	2nd Quintile
4	38.98117	-77.0582	2nd Quintile
4	38.94834	-77.0241	2nd Quintile
4	38.94081	-77.0367	2nd Quintile
4	38.98361	-77.0528	2nd Quintile
4	38.95192	-77.0254	2nd Quintile
4	38.97699	-77.0266	2nd Quintile
4	38.95108	-77.0179	2nd Quintile
4	38.96361	-77.0162	2nd Quintile
4	38.98717	-77.0328	2nd Quintile
4	38.96132	-77.0281	2nd Quintile
4	38.98404	-77.0324	2nd Quintile
4	38.95931	-77.0369	2nd Quintile
4	38.96018	-77.017	2nd Quintile
4	38.95828	-77.0315	2nd Quintile
4	38.96273	-77.0172	2nd Quintile
4	38.97581	-77.0218	2nd Quintile
4	38.95748	-77.0174	2nd Quintile
4	38.96048	-77.0028	2nd Quintile
4	38.96194	-77.0611	2nd Quintile
4	38.94831	-77.0345	2nd Quintile
4	38.96594	-77.0277	2nd Quintile
4	38.94742	-77.019	2nd Quintile

4	38.9611	-77.0597	2nd Quintile
4	38.96021	-77.0199	2nd Quintile
4	38.96379	-77.0271	2nd Quintile
4	38.95971	-77.0588	2nd Quintile
4	38.99101	-77.0349	2nd Quintile
4	38.9794	-77.0292	2nd Quintile
4	38.94079	-77.0455	2nd Quintile
4	38.94664	-77.0236	2nd Quintile
4	38.94778	-77.0268	2nd Quintile
4	38.96382	-77.0623	2nd Quintile
4	38.94446	-77.0172	2nd Quintile
4	38.95479	-77.0279	2nd Quintile
4	38.95887	-77.0212	2nd Quintile
4	38.97287	-77.0703	2nd Quintile
4	38.94776	-77.0254	2nd Quintile
4	38.93762	-77.032	2nd Quintile
4	38.9593	-77.0116	2nd Quintile
4	38.96192	-77.029	2nd Quintile
4	38.96061	-77.0588	2nd Quintile
4	38.95	-77.0179	2nd Quintile
4	38.94908	-77.0241	2nd Quintile
4	38.95542	-77.0179	2nd Quintile
4	38.98789	-77.0467	2nd Quintile
4	38.96614	-77.0363	2nd Quintile
4	38.97403	-77.0675	2nd Quintile
4	38.96898	-77.0281	2nd Quintile
4	38.96324	-77.0028	2nd Quintile
4	38.94979	-77.0249	2nd Quintile
4	38.96977	-77.0677	2nd Quintile
4	38.95189	-77.0297	2nd Quintile
4	38.94743	-77.0269	2nd Quintile
4	38.94481	-77.0263	2nd Quintile
4	38.94317	-77.0182	2nd Quintile
4	38.94863	-77.0237	2nd Quintile
4	38.96099	-77.0646	2nd Quintile
4	38.97581	-77.0223	2nd Quintile
4	38.94635	-77.0191	2nd Quintile
4	38.96721	-77.0242	2nd Quintile
4	38.95415	-77.0257	2nd Quintile
4	38.98229	-77.0297	2nd Quintile
4	38.96323	-77.0614	2nd Quintile
4	38.98035	-77.0279	2nd Quintile
4	38.96993	-77.03	2nd Quintile
4	38.94828	-77.0314	2nd Quintile
4	38.98416	-77.0338	2nd Quintile
4	38.9577	-77.0135	2nd Quintile
4	38.95821	-77.0297	2nd Quintile

4	38.97079	-77.0233	2nd Quintile
4	38.96463	-77.0574	2nd Quintile
4	38.9804	-77.0307	2nd Quintile
4	38.98068	-77.0245	2nd Quintile
4	38.94617	-77.0218	2nd Quintile
4	38.96213	-77.0295	2nd Quintile
4	38.9441	-77.0229	2nd Quintile
4	38.96273	-77.0143	2nd Quintile
4	38.94007	-77.0162	2nd Quintile
4	38.94842	-77.0354	2nd Quintile
4	38.94931	-77.0328	2nd Quintile
4	38.94816	-77.0195	2nd Quintile
4	38.93995	-77.0182	2nd Quintile
4	38.96182	-77.0563	1st Quintile
4	38.95229	-77.014	1st Quintile
4	38.96612	-77.0191	1st Quintile
4	38.93869	-77.0296	1st Quintile
4	38.94087	-77.0233	1st Quintile
4	38.93974	-77.0314	1st Quintile
4	38.94834	-77.0297	1st Quintile
4	38.96189	-77.0199	1st Quintile
4	38.95426	-77.0216	1st Quintile
4	38.96765	-77.0122	1st Quintile
4	38.96273	-77.0205	1st Quintile
4	38.96114	-77.0639	1st Quintile
4	38.9832	-77.0299	1st Quintile
4	38.95745	-77.0171	1st Quintile
4	38.96026	-77.0365	1st Quintile
4	38.93866	-77.0248	1st Quintile
4	38.9463	-77.0208	1st Quintile
4	38.9519	-77.0289	1st Quintile
4	38.9641	-77.0596	1st Quintile
4	38.98227	-77.0304	1st Quintile
4	38.94084	-77.04	1st Quintile
4	38.95876	-77.0116	1st Quintile
4	38.95696	-77.0156	1st Quintile
4	38.94332	-77.0155	1st Quintile
4	38.95098	-77.0211	1st Quintile
4	38.95873	-77.0586	1st Quintile
4	38.96902	-77.0338	1st Quintile
4	38.9511	-77.0171	1st Quintile
4	38.94903	-77.0353	1st Quintile
4	38.93964	-77.025	1st Quintile
4	38.97581	-77.0206	1st Quintile
4	38.94432	-77.0418	1st Quintile
4	38.95536	-77.0269	1st Quintile
4	38.95088	-77.0176	1st Quintile

4	38.94841	-77.0215	1st Quintile
4	38.9399	-77.0191	1st Quintile
4	38.93977	-77.0275	1st Quintile
4	38.94311	-77.0203	1st Quintile
4	38.9576	-77.0224	1st Quintile
4	38.97612	-77.0256	1st Quintile
4	38.96498	-77.026	1st Quintile
4	38.97075	-77.0285	1st Quintile
4	38.94907	-77.0246	1st Quintile
4	38.94702	-77.0253	1st Quintile
4	38.9521	-77.0189	1st Quintile
4	38.96595	-77.026	1st Quintile
4	38.95516	-77.0322	1st Quintile
4	38.97957	-77.0264	1st Quintile
4	38.94189	-77.0354	1st Quintile
4	38.9551	-77.0198	1st Quintile
4	38.99038	-77.0449	1st Quintile
4	38.94039	-77.0171	1st Quintile
4	38.94433	-77.0145	1st Quintile
4	38.94615	-77.0257	1st Quintile
4	38.96497	-77.0251	1st Quintile
4	38.96368	-77.0334	1st Quintile
4	38.95842	-77.0241	1st Quintile
4	38.94432	-77.0438	1st Quintile
4	38.96516	-77.0363	1st Quintile
4	38.97534	-77.0246	1st Quintile
4	38.95875	-77.0142	1st Quintile
4	38.96097	-77.0288	1st Quintile
4	38.94622	-77.0235	1st Quintile
4	38.94929	-77.0175	1st Quintile
4	38.95891	-77.0297	1st Quintile
4	38.96492	-77.0014	1st Quintile
4	38.95846	-76.9944	1st Quintile
4	38.97001	-77.0138	1st Quintile
4	38.95768	-77.0101	1st Quintile
4	38.95846	-77.009	1st Quintile
4	38.97299	-77.0132	1st Quintile
4	38.96034	-77.0375	1st Quintile
4	38.94518	-77.0194	1st Quintile
4	38.94745	-77.0173	1st Quintile
4	38.94837	-77.0402	1st Quintile
4	38.96584	-77.0594	1st Quintile
4	38.941	-77.019	1st Quintile
4	38.96452	-77.0628	1st Quintile
4	38.96496	-77.0236	1st Quintile
4	38.95315	-77.0176	1st Quintile
4	38.96442	-77.0027	1st Quintile

4	38.96611	-77.0257	1st Quintile
4	38.94631	-77.0202	1st Quintile
4	38.96273	-77.0195	1st Quintile
4	38.95876	-77.0125	1st Quintile
4	38.94924	-77.0237	1st Quintile
4	38.96325	-77.0201	1st Quintile
4	38.98606	-77.0285	1st Quintile
4	38.94667	-77.0357	1st Quintile
4	38.94125	-77.0254	1st Quintile
4	38.93751	-77.0253	1st Quintile
4	38.94268	-77.0172	1st Quintile
4	38.93761	-77.0291	1st Quintile
4	38.95691	-77.0178	1st Quintile
4	38.95454	-77.0125	1st Quintile
4	38.93907	-77.0167	1st Quintile
4	38.95298	-77.0348	1st Quintile
4	38.9737	-77.0125	1st Quintile
4	38.95189	-77.0159	1st Quintile
4	38.94613	-77.0282	1st Quintile
4	38.94506	-77.0271	1st Quintile
4	38.96454	-77.0242	1st Quintile
4	38.96496	-77.0175	1st Quintile
4	38.94301	-77.0172	1st Quintile
4	38.96793	-77.0247	1st Quintile
4	38.95731	-77.0322	1st Quintile
4	38.96011	-76.9971	1st Quintile
4	38.96111	-77.0297	1st Quintile
4	38.97582	-77.0209	1st Quintile
4	38.94435	-77.0155	1st Quintile
4	38.9573	-77.0296	1st Quintile
4	38.94915	-77.0157	1st Quintile
4	38.94749	-77.0356	1st Quintile
4	38.93868	-77.0304	1st Quintile
4	38.94506	-77.0316	1st Quintile
4	38.96822	-77.0212	1st Quintile
4	38.95188	-77.0309	1st Quintile
4	38.93974	-77.0307	1st Quintile
4	38.96731	-77.0223	1st Quintile
4	38.93549	-77.0267	1st Quintile
4	38.93975	-77.0333	1st Quintile
4	38.94976	-77.0352	1st Quintile
4	38.93763	-77.0326	1st Quintile
4	38.94607	-77.0267	1st Quintile
4	38.94083	-77.0254	1st Quintile
4	38.95731	-77.0357	1st Quintile
4	38.9472	-77.0284	1st Quintile
4	38.95838	-77.0335	1st Quintile

4	38.94872	-77.0271	1st Quintile
4	38.94825	-77.0278	1st Quintile
4	38.96024	-77.0349	1st Quintile
4	38.95518	-77.0297	1st Quintile
4	38.949	-77.0311	1st Quintile
4	38.95622	-77.0329	1st Quintile
4	38.95079	-77.0274	1st Quintile
5	38.94176	-76.9763	5th Quintile
5	38.94133	-76.9762	5th Quintile
5	38.93993	-76.9762	5th Quintile
5	38.94036	-76.9761	5th Quintile
5	38.95437	-76.9898	5th Quintile
5	38.94108	-76.9783	5th Quintile
5	38.94926	-77.0064	5th Quintile
5	38.94089	-76.9789	5th Quintile
5	38.94528	-76.9885	5th Quintile
5	38.92636	-76.9822	5th Quintile
5	38.93905	-76.9931	5th Quintile
5	38.94031	-76.9754	5th Quintile
5	38.93963	-76.9903	5th Quintile
5	38.92023	-77.0008	5th Quintile
5	38.95497	-77.0016	5th Quintile
5	38.93511	-76.9798	5th Quintile
5	38.94043	-76.9767	5th Quintile
5	38.94061	-76.9774	5th Quintile
5	38.92968	-76.9887	5th Quintile
5	38.94074	-76.9761	5th Quintile
5	38.93832	-76.9737	5th Quintile
5	38.9351	-76.9785	5th Quintile
5	38.94971	-77.0065	5th Quintile
5	38.90575	-76.9808	5th Quintile
5	38.9089	-76.9823	5th Quintile
5	38.93409	-76.9798	5th Quintile
5	38.90647	-76.989	5th Quintile
5	38.91402	-77.0153	5th Quintile
5	38.93315	-76.9762	5th Quintile
5	38.93992	-76.9802	5th Quintile
5	38.9283	-76.9793	5th Quintile
5	38.95163	-76.9868	5th Quintile
5	38.92802	-76.9823	5th Quintile
5	38.93049	-76.9925	5th Quintile
5	38.9351	-76.9773	5th Quintile
5	38.94202	-76.9803	5th Quintile
5	38.92561	-76.9909	5th Quintile
5	38.93403	-76.9813	5th Quintile
5	38.9407	-76.9743	5th Quintile
5	38.921	-76.9661	5th Quintile

5	38.94072	-76.9785	5th Quintile
5	38.92238	-76.9652	5th Quintile
5	38.93116	-76.9764	5th Quintile
5	38.93548	-76.9762	5th Quintile
5	38.91262	-77.0166	5th Quintile
5	38.9186	-77.0037	5th Quintile
5	38.9341	-76.9775	5th Quintile
5	38.92487	-76.9654	5th Quintile
5	38.93167	-76.9722	5th Quintile
5	38.9572	-76.9915	5th Quintile
5	38.90029	-76.9762	5th Quintile
5	38.93832	-76.9783	5th Quintile
5	38.92658	-76.9859	5th Quintile
5	38.92023	-76.9821	5th Quintile
5	38.93115	-76.9783	5th Quintile
5	38.95216	-76.9906	5th Quintile
5	38.93311	-76.9798	5th Quintile
5	38.93793	-76.9936	5th Quintile
5	38.92814	-76.9809	5th Quintile
5	38.94257	-76.9804	5th Quintile
5	38.91153	-77.0152	5th Quintile
5	38.92603	-76.969	5th Quintile
5	38.90638	-76.9789	5th Quintile
5	38.94083	-76.9802	5th Quintile
5	38.94074	-76.9753	5th Quintile
5	38.93102	-76.9819	5th Quintile
5	38.92749	-76.9793	5th Quintile
5	38.91113	-77.0106	5th Quintile
5	38.9024	-76.9839	5th Quintile
5	38.93826	-76.9762	5th Quintile
5	38.95404	-76.9876	5th Quintile
5	38.93278	-76.9864	5th Quintile
5	38.93248	-76.9669	5th Quintile
5	38.91186	-77.0086	5th Quintile
5	38.91631	-77.0142	5th Quintile
5	38.90964	-77.0084	5th Quintile
5	38.95603	-76.9977	5th Quintile
5	38.9551	-76.9991	5th Quintile
5	38.93961	-76.9762	5th Quintile
5	38.92368	-76.9651	5th Quintile
5	38.90565	-76.9753	5th Quintile
5	38.92956	-76.9913	5th Quintile
5	38.93475	-76.9869	5th Quintile
5	38.94047	-76.9792	5th Quintile
5	38.93725	-76.9722	5th Quintile
5	38.94017	-76.9792	5th Quintile
5	38.92032	-76.9817	5th Quintile

5	38.94181	-76.9922	5th Quintile
5	38.94233	-76.9762	5th Quintile
5	38.90036	-76.979	5th Quintile
5	38.91261	-77.0154	5th Quintile
5	38.92451	-76.9723	5th Quintile
5	38.94685	-77.0084	5th Quintile
5	38.93034	-76.9742	5th Quintile
5	38.90253	-76.979	5th Quintile
5	38.93112	-76.9742	5th Quintile
5	38.956	-76.9982	5th Quintile
5	38.92131	-77.0039	5th Quintile
5	38.91409	-77.0111	4th Quintile
5	38.92235	-77.0038	4th Quintile
5	38.95414	-76.9957	4th Quintile
5	38.95496	-77.002	4th Quintile
5	38.90859	-77.0057	4th Quintile
5	38.93865	-76.9932	4th Quintile
5	38.92166	-77.0041	4th Quintile
5	38.94947	-76.9885	4th Quintile
5	38.91291	-77.0152	4th Quintile
5	38.95318	-76.9881	4th Quintile
5	38.9235	-76.9665	4th Quintile
5	38.92131	-77.0035	4th Quintile
5	38.91426	-77.0142	4th Quintile
5	38.89909	-76.9769	4th Quintile
5	38.91041	-77.0148	4th Quintile
5	38.94068	-76.9814	4th Quintile
5	38.93341	-76.9738	4th Quintile
5	38.93057	-76.9684	4th Quintile
5	38.92773	-76.986	4th Quintile
5	38.95491	-76.9901	4th Quintile
5	38.92132	-77.0106	4th Quintile
5	38.93197	-76.9684	4th Quintile
5	38.92237	-76.9637	4th Quintile
5	38.90979	-76.9865	4th Quintile
5	38.92015	-76.979	4th Quintile
5	38.93259	-76.9665	4th Quintile
5	38.92509	-76.9857	4th Quintile
5	38.94149	-77.0059	4th Quintile
5	38.93298	-76.9734	4th Quintile
5	38.93777	-76.9683	4th Quintile
5	38.90395	-76.9847	4th Quintile
5	38.93245	-76.9863	4th Quintile
5	38.92743	-76.9952	4th Quintile
5	38.95421	-76.9944	4th Quintile
5	38.92518	-76.9653	4th Quintile
5	38.94898	-77.0063	4th Quintile

5	38.93214	-76.9781	4th Quintile
5	38.90701	-76.9888	4th Quintile
5	38.92767	-76.9808	4th Quintile
5	38.93724	-76.9886	4th Quintile
5	38.95099	-76.9895	4th Quintile
5	38.9273	-76.9824	4th Quintile
5	38.93771	-76.9762	4th Quintile
5	38.92237	-76.9614	4th Quintile
5	38.9323	-76.9676	4th Quintile
5	38.93176	-76.9742	4th Quintile
5	38.9336	-76.9742	4th Quintile
5	38.91333	-77.0089	4th Quintile
5	38.90963	-77.0158	4th Quintile
5	38.92401	-76.984	4th Quintile
5	38.91701	-77.0053	4th Quintile
5	38.95125	-76.9857	4th Quintile
5	38.93	-76.9809	4th Quintile
5	38.93086	-76.9853	4th Quintile
5	38.92044	-77.0122	4th Quintile
5	38.93064	-76.9742	4th Quintile
5	38.95351	-76.9895	4th Quintile
5	38.93625	-76.9722	4th Quintile
5	38.94731	-76.9949	4th Quintile
5	38.94007	-76.9742	4th Quintile
5	38.94174	-76.9773	4th Quintile
5	38.93664	-76.9762	4th Quintile
5	38.93972	-76.9752	4th Quintile
5	38.91391	-77.0165	4th Quintile
5	38.91262	-77.0121	4th Quintile
5	38.95547	-76.9937	4th Quintile
5	38.94288	-77.0053	4th Quintile
5	38.93612	-76.9659	4th Quintile
5	38.93825	-76.9934	4th Quintile
5	38.91327	-77.0152	4th Quintile
5	38.93496	-76.9762	4th Quintile
5	38.93315	-76.9743	4th Quintile
5	38.93015	-76.9781	4th Quintile
5	38.90618	-76.9899	4th Quintile
5	38.92227	-76.961	4th Quintile
5	38.95547	-76.9941	4th Quintile
5	38.94028	-76.9927	4th Quintile
5	38.93286	-76.9639	4th Quintile
5	38.93409	-76.9762	4th Quintile
5	38.95685	-76.9911	4th Quintile
5	38.92537	-76.9905	4th Quintile
5	38.95126	-76.9895	4th Quintile
5	38.93116	-76.9756	4th Quintile

5	38.91559	-77.0071	4th Quintile
5	38.91703	-77.0102	4th Quintile
5	38.92253	-76.9665	4th Quintile
5	38.90981	-76.9878	4th Quintile
5	38.91814	-77.0004	4th Quintile
5	38.93451	-76.9916	4th Quintile
5	38.92622	-76.9859	4th Quintile
5	38.91021	-76.9972	4th Quintile
5	38.90253	-76.9818	4th Quintile
5	38.90384	-76.9895	3rd Quintile
5	38.9289	-76.9884	3rd Quintile
5	38.9192	-76.9844	3rd Quintile
5	38.95564	-76.9912	3rd Quintile
5	38.93705	-76.9762	3rd Quintile
5	38.90373	-76.9789	3rd Quintile
5	38.93115	-76.9776	3rd Quintile
5	38.9362	-76.9702	3rd Quintile
5	38.91335	-77.0126	3rd Quintile
5	38.93942	-76.9752	3rd Quintile
5	38.91631	-77.0128	3rd Quintile
5	38.91234	-77.0152	3rd Quintile
5	38.9141	-77.0135	3rd Quintile
5	38.93063	-76.995	3rd Quintile
5	38.91119	-77.0088	3rd Quintile
5	38.91215	-77.0087	3rd Quintile
5	38.94524	-76.9878	3rd Quintile
5	38.95638	-76.9954	3rd Quintile
5	38.93876	-76.9951	3rd Quintile
5	38.92931	-76.9676	3rd Quintile
5	38.93017	-76.9763	3rd Quintile
5	38.92691	-76.9822	3rd Quintile
5	38.92976	-76.9748	3rd Quintile
5	38.90793	-76.9804	3rd Quintile
5	38.92966	-76.9794	3rd Quintile
5	38.93267	-76.9661	3rd Quintile
5	38.93017	-76.9751	3rd Quintile
5	38.92774	-76.9679	3rd Quintile
5	38.94796	-76.9927	3rd Quintile
5	38.91558	-77.0049	3rd Quintile
5	38.94023	-76.9809	3rd Quintile
5	38.93688	-76.9712	3rd Quintile
5	38.94348	-76.9883	3rd Quintile
5	38.95566	-76.9985	3rd Quintile
5	38.89897	-76.9762	3rd Quintile
5	38.91259	-77.0092	3rd Quintile
5	38.91996	-76.9821	3rd Quintile
5	38.94151	-77.0053	3rd Quintile

5	38.93289	-76.9844	3rd Quintile
5	38.94095	-76.9883	3rd Quintile
5	38.95129	-76.9917	3rd Quintile
5	38.92931	-76.9702	3rd Quintile
5	38.93832	-76.9789	3rd Quintile
5	38.93178	-76.9651	3rd Quintile
5	38.90425	-76.9855	3rd Quintile
5	38.95359	-76.9925	3rd Quintile
5	38.92023	-77.0147	3rd Quintile
5	38.95061	-76.9895	3rd Quintile
5	38.94247	-76.9833	3rd Quintile
5	38.9276	-76.9823	3rd Quintile
5	38.93214	-76.9721	3rd Quintile
5	38.9539	-76.9954	3rd Quintile
5	38.93967	-76.9736	3rd Quintile
5	38.93966	-76.9729	3rd Quintile
5	38.93163	-76.9615	3rd Quintile
5	38.92243	-76.9808	3rd Quintile
5	38.90204	-76.9789	3rd Quintile
5	38.9341	-76.9779	3rd Quintile
5	38.92669	-76.9808	3rd Quintile
5	38.93967	-76.9797	3rd Quintile
5	38.93578	-76.9799	3rd Quintile
5	38.95182	-76.9896	3rd Quintile
5	38.93995	-76.9903	3rd Quintile
5	38.92698	-76.9827	3rd Quintile
5	38.9297	-76.9669	3rd Quintile
5	38.91036	-77.0081	3rd Quintile
5	38.92559	-76.9757	3rd Quintile
5	38.93786	-76.971	3rd Quintile
5	38.93139	-76.9843	3rd Quintile
5	38.92652	-76.9667	3rd Quintile
5	38.90833	-76.9827	3rd Quintile
5	38.92887	-76.9768	3rd Quintile
5	38.90945	-76.9869	3rd Quintile
5	38.95096	-76.9917	3rd Quintile
5	38.93093	-76.9794	3rd Quintile
5	38.92449	-76.9855	3rd Quintile
5	38.9126	-77.0072	3rd Quintile
5	38.91706	-77.0145	3rd Quintile
5	38.90019	-76.9743	3rd Quintile
5	38.92379	-76.9843	3rd Quintile
5	38.90588	-76.9853	3rd Quintile
5	38.93341	-76.9797	3rd Quintile
5	38.90166	-76.9863	3rd Quintile
5	38.92556	-76.9966	3rd Quintile
5	38.90342	-76.979	3rd Quintile

5	38.93936	-76.9733	3rd Quintile
5	38.91484	-77.0112	3rd Quintile
5	38.92982	-76.9762	3rd Quintile
5	38.93145	-76.9742	3rd Quintile
5	38.95455	-76.9933	3rd Quintile
5	38.93017	-76.9785	3rd Quintile
5	38.94286	-76.9764	3rd Quintile
5	38.92866	-76.9793	3rd Quintile
5	38.94074	-76.9819	3rd Quintile
5	38.9149	-77.0079	3rd Quintile
5	38.95324	-76.9946	2nd Quintile
5	38.9493	-76.995	2nd Quintile
5	38.93286	-76.9629	2nd Quintile
5	38.91702	-77.0043	2nd Quintile
5	38.92235	-76.962	2nd Quintile
5	38.95627	-76.9979	2nd Quintile
5	38.9439	-76.9762	2nd Quintile
5	38.93015	-76.9774	2nd Quintile
5	38.93126	-76.9722	2nd Quintile
5	38.93969	-76.978	2nd Quintile
5	38.91262	-77.0081	2nd Quintile
5	38.91409	-77.0115	2nd Quintile
5	38.95455	-76.9918	2nd Quintile
5	38.92239	-76.9648	2nd Quintile
5	38.94448	-76.9759	2nd Quintile
5	38.93832	-76.9722	2nd Quintile
5	38.92128	-77.0123	2nd Quintile
5	38.95162	-76.9881	2nd Quintile
5	38.92705	-76.9806	2nd Quintile
5	38.93879	-76.9762	2nd Quintile
5	38.93017	-76.9791	2nd Quintile
5	38.94134	-76.9773	2nd Quintile
5	38.94268	-76.9773	2nd Quintile
5	38.91814	-77.0136	2nd Quintile
5	38.91943	-76.9821	2nd Quintile
5	38.93378	-76.9682	2nd Quintile
5	38.92359	-76.9828	2nd Quintile
5	38.95545	-76.9922	2nd Quintile
5	38.92343	-76.9632	2nd Quintile
5	38.93477	-76.9753	2nd Quintile
5	38.9034	-76.9862	2nd Quintile
5	38.92727	-76.9797	2nd Quintile
5	38.93879	-76.9725	2nd Quintile
5	38.93013	-76.9757	2nd Quintile
5	38.94619	-77.0055	2nd Quintile
5	38.93908	-76.9883	2nd Quintile
5	38.9108	-77.0092	2nd Quintile

5	38.92872	-76.986	2nd Quintile
5	38.92556	-76.997	2nd Quintile
5	38.92418	-76.9808	2nd Quintile
5	38.93105	-76.9811	2nd Quintile
5	38.95163	-76.9887	2nd Quintile
5	38.94126	-76.991	2nd Quintile
5	38.92675	-76.9864	2nd Quintile
5	38.91409	-77.0101	2nd Quintile
5	38.93115	-76.9862	2nd Quintile
5	38.90105	-76.979	2nd Quintile
5	38.95227	-76.9917	2nd Quintile
5	38.90225	-76.9869	2nd Quintile
5	38.93083	-76.9859	2nd Quintile
5	38.94291	-76.9838	2nd Quintile
5	38.91406	-77.0148	2nd Quintile
5	38.9351	-76.9766	2nd Quintile
5	38.95547	-76.9928	2nd Quintile
5	38.92832	-76.9777	2nd Quintile
5	38.92569	-76.9858	2nd Quintile
5	38.94272	-76.9783	2nd Quintile
5	38.92816	-76.9796	2nd Quintile
5	38.93383	-76.9797	2nd Quintile
5	38.91388	-77.0172	2nd Quintile
5	38.94576	-77.0066	2nd Quintile
5	38.93079	-76.9885	2nd Quintile
5	38.91567	-76.9849	2nd Quintile
5	38.93274	-76.9873	2nd Quintile
5	38.93826	-76.9718	2nd Quintile
5	38.90211	-76.982	2nd Quintile
5	38.93921	-76.9762	2nd Quintile
5	38.93174	-76.9689	2nd Quintile
5	38.93287	-76.9655	2nd Quintile
5	38.95144	-76.9863	2nd Quintile
5	38.94428	-76.9865	2nd Quintile
5	38.93374	-76.987	2nd Quintile
5	38.93394	-76.9829	2nd Quintile
5	38.91123	-77.0162	2nd Quintile
5	38.94164	-76.9883	2nd Quintile
5	38.93032	-76.9691	2nd Quintile
5	38.92111	-76.9664	2nd Quintile
5	38.90856	-77.0155	2nd Quintile
5	38.90434	-76.9832	2nd Quintile
5	38.92107	-76.9883	2nd Quintile
5	38.92512	-76.9962	2nd Quintile
5	38.93815	-77.0069	2nd Quintile
5	38.93215	-76.9641	2nd Quintile
5	38.90504	-76.9849	2nd Quintile

5	38.91165	-77.0162	2nd Quintile
5	38.9141	-77.0126	2nd Quintile
5	38.92124	-76.9658	2nd Quintile
5	38.93737	-76.9936	2nd Quintile
5	38.92451	-76.9746	2nd Quintile
5	38.93297	-76.9927	2nd Quintile
5	38.92575	-76.9924	2nd Quintile
5	38.93454	-76.9846	2nd Quintile
5	38.92345	-77.0025	2nd Quintile
5	38.93779	-76.9688	2nd Quintile
5	38.92324	-76.9807	2nd Quintile
5	38.93833	-76.9751	2nd Quintile
5	38.91055	-77.0152	2nd Quintile
5	38.9318	-76.9637	2nd Quintile
5	38.94886	-76.9958	2nd Quintile
5	38.93779	-76.9697	2nd Quintile
5	38.91295	-77.0142	2nd Quintile
5	38.91703	-77.0095	2nd Quintile
5	38.95105	-76.9868	2nd Quintile
5	38.9126	-77.0034	2nd Quintile
5	38.91262	-77.016	2nd Quintile
5	38.91262	-77.0077	2nd Quintile
5	38.93487	-76.9842	1st Quintile
5	38.93098	-76.9828	1st Quintile
5	38.92651	-76.9652	1st Quintile
5	38.9034	-76.9762	1st Quintile
5	38.93832	-76.9766	1st Quintile
5	38.91261	-77.0104	1st Quintile
5	38.94071	-76.9934	1st Quintile
5	38.92193	-77.0035	1st Quintile
5	38.917	-77.0068	1st Quintile
5	38.9431	-76.9773	1st Quintile
5	38.9051	-76.982	1st Quintile
5	38.92727	-76.9801	1st Quintile
5	38.93405	-76.9701	1st Quintile
5	38.94122	-76.9903	1st Quintile
5	38.92749	-76.9633	1st Quintile
5	38.91264	-77.0086	1st Quintile
5	38.93094	-76.9721	1st Quintile
5	38.91628	-77.0089	1st Quintile
5	38.91271	-77.0066	1st Quintile
5	38.91702	-77.0049	1st Quintile
5	38.929	-76.9808	1st Quintile
5	38.91187	-77.0079	1st Quintile
5	38.93978	-76.9742	1st Quintile
5	38.91922	-76.98	1st Quintile
5	38.93057	-76.9628	1st Quintile

5	38.9156	-77.001	1st Quintile
5	38.921	-76.9878	1st Quintile
5	38.92994	-76.9825	1st Quintile
5	38.93622	-76.9711	1st Quintile
5	38.9421	-76.9773	1st Quintile
5	38.95562	-77.0049	1st Quintile
5	38.91919	-76.9812	1st Quintile
5	38.94289	-76.9792	1st Quintile
5	38.95164	-76.9891	1st Quintile
5	38.92105	-77.002	1st Quintile
5	38.93365	-76.9865	1st Quintile
5	38.93257	-76.9811	1st Quintile
5	38.93283	-76.9859	1st Quintile
5	38.9334	-76.9927	1st Quintile
5	38.91198	-76.9848	1st Quintile
5	38.93076	-76.9679	1st Quintile
5	38.94642	-76.9889	1st Quintile
5	38.91627	-77.0133	1st Quintile
5	38.93606	-76.9864	1st Quintile
5	38.90303	-76.9825	1st Quintile
5	38.91755	-77.002	1st Quintile
5	38.93234	-76.9983	1st Quintile
5	38.93452	-76.9912	1st Quintile
5	38.93215	-76.9773	1st Quintile
5	38.92354	-77.0035	1st Quintile
5	38.94301	-76.9873	1st Quintile
5	38.91931	-77.002	1st Quintile
5	38.94942	-76.9906	1st Quintile
5	38.93901	-76.9903	1st Quintile
5	38.93512	-76.9701	1st Quintile
5	38.93314	-76.9748	1st Quintile
5	38.92906	-76.9772	1st Quintile
5	38.94111	-76.9819	1st Quintile
5	38.93645	-76.9815	1st Quintile
5	38.93771	-76.9905	1st Quintile
5	38.93283	-76.9644	1st Quintile
5	38.92926	-76.9644	1st Quintile
5	38.9002	-76.9838	1st Quintile
5	38.90528	-76.9916	1st Quintile
5	38.92768	-76.9962	1st Quintile
5	38.95386	-76.9873	1st Quintile
5	38.94271	-76.9857	1st Quintile
5	38.92045	-76.9637	1st Quintile
5	38.94505	-77.0074	1st Quintile
5	38.95549	-76.9961	1st Quintile
5	38.94288	-77.0037	1st Quintile
5	38.93134	-76.9811	1st Quintile

5	38.93727	-76.9896	1st Quintile
5	38.93138	-76.9953	1st Quintile
5	38.93289	-76.9677	1st Quintile
5	38.9432	-76.9842	1st Quintile
5	38.90781	-76.9887	1st Quintile
5	38.95057	-76.9868	1st Quintile
5	38.93157	-76.9657	1st Quintile
5	38.92072	-76.9655	1st Quintile
5	38.93448	-76.9923	1st Quintile
5	38.90009	-76.9791	1st Quintile
5	38.91798	-77.0051	1st Quintile
5	38.95034	-76.9917	1st Quintile
5	38.92944	-77.018	1st Quintile
5	38.93287	-76.9667	1st Quintile
5	38.90143	-76.9788	1st Quintile
5	38.93099	-76.9673	1st Quintile
5	38.94723	-76.9898	1st Quintile
5	38.95514	-76.9916	1st Quintile
5	38.95721	-76.9942	1st Quintile
5	38.94896	-76.997	1st Quintile
5	38.93113	-76.9669	1st Quintile
5	38.90178	-76.9873	1st Quintile
5	38.93239	-76.9973	1st Quintile
5	38.93411	-76.9793	1st Quintile
5	38.94303	-77.003	1st Quintile
5	38.95192	-76.9968	1st Quintile
5	38.90373	-76.9773	1st Quintile
5	38.92102	-76.9893	1st Quintile
5	38.92013	-76.9701	1st Quintile
5	38.91122	-76.9859	1st Quintile
5	38.91332	-76.9861	1st Quintile
5	38.95171	-76.9917	1st Quintile
5	38.90478	-76.9852	1st Quintile
5	38.93727	-76.9891	1st Quintile
5	38.94884	-76.9966	1st Quintile
5	38.90621	-76.9805	1st Quintile
5	38.91325	-76.9839	1st Quintile
5	38.93411	-76.9789	1st Quintile
5	38.93411	-76.9753	1st Quintile
5	38.9329	-76.9671	1st Quintile
5	38.9428	-76.9883	1st Quintile
5	38.93264	-76.9729	1st Quintile
5	38.91969	-76.9704	1st Quintile
5	38.93014	-76.9615	1st Quintile
5	38.92898	-76.9682	1st Quintile
5	38.94708	-76.9827	1st Quintile
5	38.90917	-76.9863	1st Quintile

5	38.94634	-76.9779	1st Quintile
5	38.92937	-76.9654	1st Quintile
5	38.93588	-76.9931	1st Quintile
5	38.92031	-76.9868	1st Quintile
5	38.90683	-76.9873	1st Quintile
5	38.91248	-76.9905	1st Quintile
5	38.92789	-76.9637	1st Quintile
5	38.92401	-76.9722	1st Quintile
5	38.92887	-76.9649	1st Quintile
5	38.92108	-76.9888	1st Quintile
5	38.92695	-76.9631	1st Quintile
5	38.94215	-77.0058	1st Quintile
5	38.94271	-77.0044	1st Quintile
6	38.89094	-76.9821	5th Quintile
6	38.88896	-76.9926	5th Quintile
6	38.88575	-77.0003	5th Quintile
6	38.88316	-77.0021	5th Quintile
6	38.90727	-77.0156	5th Quintile
6	38.88786	-77.0006	5th Quintile
6	38.87933	-76.9926	5th Quintile
6	38.89359	-76.994	5th Quintile
6	38.88412	-76.9854	5th Quintile
6	38.90374	-76.9944	5th Quintile
6	38.88279	-76.9938	5th Quintile
6	38.8814	-76.9938	5th Quintile
6	38.88967	-77.002	5th Quintile
6	38.90133	-76.9883	5th Quintile
6	38.88211	-77.0021	5th Quintile
6	38.90341	-77.0021	5th Quintile
6	38.88331	-76.9916	5th Quintile
6	38.88412	-76.9905	5th Quintile
6	38.88609	-76.9902	5th Quintile
6	38.9042	-76.9962	5th Quintile
6	38.89504	-77.002	5th Quintile
6	38.88347	-76.9927	5th Quintile
6	38.90376	-76.9982	5th Quintile
6	38.90302	-77.0019	5th Quintile
6	38.90566	-77.0028	5th Quintile
6	38.89665	-76.9938	5th Quintile
6	38.90565	-77.0021	5th Quintile
6	38.9053	-76.9984	5th Quintile
6	38.88605	-76.9916	5th Quintile
6	38.91115	-77.0171	5th Quintile
6	38.89614	-77.0034	5th Quintile
6	38.8904	-76.9914	5th Quintile
6	38.90726	-77.0198	5th Quintile
6	38.90565	-77	5th Quintile

6	38.90013	-76.9841	5th Quintile
6	38.88061	-76.9856	5th Quintile
6	38.8831	-77.0006	5th Quintile
6	38.89044	-76.9938	5th Quintile
6	38.88771	-76.9962	5th Quintile
6	38.89092	-76.9811	5th Quintile
6	38.89371	-76.9915	5th Quintile
6	38.88842	-76.9938	5th Quintile
6	38.88224	-76.9927	5th Quintile
6	38.89341	-77.0021	5th Quintile
6	38.89512	-77.0035	5th Quintile
6	38.90133	-76.9921	5th Quintile
6	38.88545	-76.979	5th Quintile
6	38.89612	-77.0026	5th Quintile
6	38.88892	-76.9985	5th Quintile
6	38.89879	-76.9915	5th Quintile
6	38.91171	-77.0229	5th Quintile
6	38.89482	-76.9903	5th Quintile
6	38.89616	-76.9962	5th Quintile
6	38.90091	-76.9883	5th Quintile
6	38.9059	-76.9995	5th Quintile
6	38.89094	-77	5th Quintile
6	38.88411	-76.9867	5th Quintile
6	38.88253	-76.9927	5th Quintile
6	38.90379	-76.9962	5th Quintile
6	38.88412	-76.9857	5th Quintile
6	38.90375	-76.9948	5th Quintile
6	38.88945	-76.9995	5th Quintile
6	38.88043	-76.9859	5th Quintile
6	38.89803	-76.9837	5th Quintile
6	38.88545	-76.9985	5th Quintile
6	38.90966	-77.0195	5th Quintile
6	38.88834	-76.9962	5th Quintile
6	38.89168	-76.9856	5th Quintile
6	38.9038	-77.0021	5th Quintile
6	38.88244	-77.0021	5th Quintile
6	38.88428	-77.0017	5th Quintile
6	38.89482	-77.0035	5th Quintile
6	38.90495	-76.9995	5th Quintile
6	38.88746	-76.9985	5th Quintile
6	38.88179	-76.9938	5th Quintile
6	38.88462	-76.9883	5th Quintile
6	38.90327	-76.9916	5th Quintile
6	38.90859	-77.0161	5th Quintile
6	38.88042	-76.9995	5th Quintile
6	38.88412	-76.9927	5th Quintile
6	38.88772	-76.9995	5th Quintile

6	38.88528	-76.9927	5th Quintile
6	38.90297	-76.9985	5th Quintile
6	38.88607	-77.0035	5th Quintile
6	38.88682	-76.9901	5th Quintile
6	38.88431	-76.9883	5th Quintile
6	38.89543	-76.9915	5th Quintile
6	38.88408	-76.9951	5th Quintile
6	38.90376	-76.9939	5th Quintile
6	38.91114	-77.0232	5th Quintile
6	38.89042	-76.9927	5th Quintile
6	38.89094	-76.9996	5th Quintile
6	38.88879	-76.9995	5th Quintile
6	38.90481	-77.0021	5th Quintile
6	38.89549	-76.9962	5th Quintile
6	38.88709	-76.9835	5th Quintile
6	38.88161	-77.0021	5th Quintile
6	38.88844	-76.9926	5th Quintile
6	38.90234	-77.002	5th Quintile
6	38.90085	-76.9858	5th Quintile
6	38.89141	-76.9837	5th Quintile
6	38.90077	-76.989	5th Quintile
6	38.89737	-76.9915	5th Quintile
6	38.898	-76.9903	5th Quintile
6	38.89094	-76.9837	5th Quintile
6	38.89214	-76.9837	5th Quintile
6	38.89339	-76.9793	5th Quintile
6	38.90355	-76.9926	5th Quintile
6	38.9015	-76.9938	5th Quintile
6	38.88821	-76.9985	5th Quintile
6	38.90133	-76.9916	5th Quintile
6	38.88497	-76.9915	5th Quintile
6	38.90566	-76.9974	5th Quintile
6	38.88688	-76.9927	5th Quintile
6	38.88589	-77.0006	5th Quintile
6	38.88098	-76.9995	5th Quintile
6	38.90134	-77.002	5th Quintile
6	38.89732	-76.9963	5th Quintile
6	38.88495	-76.9927	5th Quintile
6	38.88965	-76.9938	5th Quintile
6	38.88381	-77.0021	5th Quintile
6	38.89598	-76.9773	5th Quintile
6	38.89614	-76.9917	5th Quintile
6	38.88428	-77.0021	5th Quintile
6	38.88135	-76.9902	5th Quintile
6	38.89094	-76.9989	5th Quintile
6	38.91014	-77.0165	4th Quintile
6	38.88008	-76.9962	4th Quintile

6	38.8837	-76.9915	4th Quintile
6	38.89838	-76.9903	4th Quintile
6	38.90265	-77.002	4th Quintile
6	38.89489	-76.9995	4th Quintile
6	38.89605	-76.9883	4th Quintile
6	38.89095	-77.0015	4th Quintile
6	38.89095	-77.0019	4th Quintile
6	38.89095	-76.9961	4th Quintile
6	38.89611	-77.0008	4th Quintile
6	38.89614	-76.9904	4th Quintile
6	38.88126	-76.9837	4th Quintile
6	38.87873	-76.9903	4th Quintile
6	38.88126	-77.0006	4th Quintile
6	38.8813	-76.9995	4th Quintile
6	38.90964	-77.0234	4th Quintile
6	38.88571	-76.9916	4th Quintile
6	38.9119	-77.0172	4th Quintile
6	38.88266	-77.0035	4th Quintile
6	38.90162	-76.9927	4th Quintile
6	38.89095	-76.9975	4th Quintile
6	38.90374	-76.9957	4th Quintile
6	38.88121	-76.9883	4th Quintile
6	38.88342	-77.0035	4th Quintile
6	38.90319	-76.9927	4th Quintile
6	38.91362	-77.0178	4th Quintile
6	38.87969	-76.9962	4th Quintile
6	38.88783	-76.9985	4th Quintile
6	38.88064	-76.9938	4th Quintile
6	38.88975	-76.9995	4th Quintile
6	38.89382	-76.9927	4th Quintile
6	38.89322	-77.0006	4th Quintile
6	38.90161	-76.9883	4th Quintile
6	38.88963	-76.9962	4th Quintile
6	38.90534	-76.9995	4th Quintile
6	38.9139	-77.0179	4th Quintile
6	38.88944	-76.9915	4th Quintile
6	38.88775	-76.9927	4th Quintile
6	38.8905	-76.9822	4th Quintile
6	38.88562	-77.0006	4th Quintile
6	38.88503	-77.0035	4th Quintile
6	38.8804	-76.9927	4th Quintile
6	38.88918	-76.9938	4th Quintile
6	38.88422	-77.0035	4th Quintile
6	38.90062	-76.9915	4th Quintile
6	38.88011	-76.9927	4th Quintile
6	38.88336	-76.979	4th Quintile
6	38.9105	-77.0167	4th Quintile

6	38.89892	-76.9948	4th Quintile
6	38.89075	-76.9883	4th Quintile
6	38.88283	-76.9902	4th Quintile
6	38.88227	-77.0035	4th Quintile
6	38.91141	-77.0229	4th Quintile
6	38.88199	-77.0034	4th Quintile
6	38.89893	-76.9995	4th Quintile
6	38.88644	-76.9915	4th Quintile
6	38.90519	-77.002	4th Quintile
6	38.90449	-76.9995	4th Quintile
6	38.88923	-77.002	4th Quintile
6	38.88087	-77.002	4th Quintile
6	38.89741	-76.9995	4th Quintile
6	38.89309	-77.0035	4th Quintile
6	38.90253	-76.9998	4th Quintile
6	38.89095	-76.9949	4th Quintile
6	38.88138	-76.9962	4th Quintile
6	38.88202	-76.9838	4th Quintile
6	38.88411	-76.9919	4th Quintile
6	38.89114	-76.9938	4th Quintile
6	38.90405	-76.995	4th Quintile
6	38.88724	-77.0035	4th Quintile
6	38.8948	-76.9946	4th Quintile
6	38.8878	-76.9938	4th Quintile
6	38.89237	-76.9938	4th Quintile
6	38.89809	-76.9995	4th Quintile
6	38.89095	-77.0005	4th Quintile
6	38.91281	-77.0175	4th Quintile
6	38.89621	-76.9855	4th Quintile
6	38.8832	-76.9822	4th Quintile
6	38.88023	-76.9854	4th Quintile
6	38.89926	-76.9794	4th Quintile
6	38.87841	-76.987	4th Quintile
6	38.88537	-76.9876	4th Quintile
6	38.88661	-76.979	4th Quintile
6	38.89358	-76.9923	4th Quintile
6	38.90482	-76.9951	4th Quintile
6	38.89095	-76.9953	4th Quintile
6	38.89999	-76.9903	4th Quintile
6	38.89186	-76.9995	4th Quintile
6	38.91189	-77.0186	4th Quintile
6	38.89796	-76.9944	4th Quintile
6	38.88646	-77.0004	4th Quintile
6	38.9025	-76.9916	4th Quintile
6	38.90195	-77.0021	4th Quintile
6	38.89314	-76.9822	4th Quintile
6	38.89339	-76.9806	4th Quintile

6	38.89599	-76.995	4th Quintile
6	38.89094	-76.9985	4th Quintile
6	38.90093	-76.9915	4th Quintile
6	38.89192	-76.9984	4th Quintile
6	38.8778	-76.9883	4th Quintile
6	38.90394	-76.9932	4th Quintile
6	38.89208	-76.9884	4th Quintile
6	38.90061	-76.9995	4th Quintile
6	38.90912	-77.0162	4th Quintile
6	38.88202	-76.9902	4th Quintile
6	38.88253	-76.9916	4th Quintile
6	38.88037	-76.9915	4th Quintile
6	38.89893	-76.9959	4th Quintile
6	38.90226	-76.9891	4th Quintile
6	38.88675	-76.9985	4th Quintile
6	38.88286	-76.9837	4th Quintile
6	38.89592	-76.9836	4th Quintile
6	38.87476	-77.0107	4th Quintile
6	38.91484	-77.0189	4th Quintile
6	38.88027	-76.995	4th Quintile
6	38.91004	-77.026	4th Quintile
6	38.88374	-77.0035	4th Quintile
6	38.89861	-76.9995	4th Quintile
6	38.90164	-76.9876	4th Quintile
6	38.91078	-77.0261	4th Quintile
6	38.88594	-76.979	4th Quintile
6	38.88753	-76.9837	4th Quintile
6	38.8996	-76.9903	4th Quintile
6	38.90064	-76.9855	4th Quintile
6	38.88933	-76.9985	4th Quintile
6	38.89096	-76.9965	4th Quintile
6	38.88608	-77.0009	4th Quintile
6	38.88645	-76.9927	4th Quintile
6	38.88868	-76.9838	4th Quintile
6	38.90131	-76.9869	4th Quintile
6	38.88916	-76.9962	4th Quintile
6	38.89376	-76.9938	4th Quintile
6	38.89336	-77.0035	4th Quintile
6	38.88136	-76.995	4th Quintile
6	38.88173	-76.9927	4th Quintile
6	38.88858	-76.9808	4th Quintile
6	38.89667	-76.981	4th Quintile
6	38.88013	-76.9984	4th Quintile
6	38.87841	-76.9849	4th Quintile
6	38.88384	-76.979	4th Quintile
6	38.89893	-76.9969	4th Quintile
6	38.88145	-76.9927	4th Quintile

6	38.91217	-77.0222	3rd Quintile
6	38.90565	-77.0199	3rd Quintile
6	38.88125	-76.9851	3rd Quintile
6	38.90191	-76.9995	3rd Quintile
6	38.89317	-76.9938	3rd Quintile
6	38.88347	-76.9962	3rd Quintile
6	38.90494	-76.9982	3rd Quintile
6	38.88812	-76.9945	3rd Quintile
6	38.88965	-76.9985	3rd Quintile
6	38.87782	-77.0006	3rd Quintile
6	38.91356	-77.0189	3rd Quintile
6	38.88605	-76.9949	3rd Quintile
6	38.90253	-76.9969	3rd Quintile
6	38.88447	-76.9926	3rd Quintile
6	38.88598	-76.9927	3rd Quintile
6	38.88277	-77.0006	3rd Quintile
6	38.91116	-77.0175	3rd Quintile
6	38.90544	-77.0031	3rd Quintile
6	38.8835	-76.9822	3rd Quintile
6	38.90529	-76.9962	3rd Quintile
6	38.88326	-77.0042	3rd Quintile
6	38.89563	-76.9938	3rd Quintile
6	38.89613	-76.9849	3rd Quintile
6	38.87845	-77.0021	3rd Quintile
6	38.89096	-76.997	3rd Quintile
6	38.88326	-77.005	3rd Quintile
6	38.88782	-76.9902	3rd Quintile
6	38.88191	-76.9897	3rd Quintile
6	38.87859	-76.9883	3rd Quintile
6	38.88682	-76.9893	3rd Quintile
6	38.87957	-76.984	3rd Quintile
6	38.89488	-76.9837	3rd Quintile
6	38.89425	-76.9985	3rd Quintile
6	38.88762	-76.9855	3rd Quintile
6	38.89792	-76.995	3rd Quintile
6	38.90501	-76.9962	3rd Quintile
6	38.88869	-77.0006	3rd Quintile
6	38.90117	-76.9865	3rd Quintile
6	38.88745	-76.9926	3rd Quintile
6	38.8948	-76.9938	3rd Quintile
6	38.88682	-76.9886	3rd Quintile
6	38.90374	-76.9994	3rd Quintile
6	38.88404	-76.9985	3rd Quintile
6	38.89145	-76.9927	3rd Quintile
6	38.9097	-77.0229	3rd Quintile
6	38.87755	-76.988	3rd Quintile
6	38.89363	-76.9903	3rd Quintile

6	38.89549	-77.0034	3rd Quintile
6	38.89729	-76.9837	3rd Quintile
6	38.89124	-76.9915	3rd Quintile
6	38.90254	-76.9988	3rd Quintile
6	38.90283	-76.9995	3rd Quintile
6	38.89611	-77.0022	3rd Quintile
6	38.90139	-76.9995	3rd Quintile
6	38.90251	-76.9922	3rd Quintile
6	38.88605	-76.9897	3rd Quintile
6	38.88047	-76.9962	3rd Quintile
6	38.90725	-77.0165	3rd Quintile
6	38.91114	-77.0237	3rd Quintile
6	38.88098	-76.9938	3rd Quintile
6	38.88281	-76.9927	3rd Quintile
6	38.90628	-76.9995	3rd Quintile
6	38.88694	-77.0035	3rd Quintile
6	38.88815	-76.9995	3rd Quintile
6	38.88604	-76.9822	3rd Quintile
6	38.90564	-76.9985	3rd Quintile
6	38.89505	-76.9962	3rd Quintile
6	38.9141	-77.0201	3rd Quintile
6	38.91086	-77.023	3rd Quintile
6	38.89009	-76.9995	3rd Quintile
6	38.89352	-76.9927	3rd Quintile
6	38.88868	-76.9944	3rd Quintile
6	38.88428	-76.9963	3rd Quintile
6	38.88884	-76.9962	3rd Quintile
6	38.89854	-76.9944	3rd Quintile
6	38.89588	-76.9915	3rd Quintile
6	38.8979	-76.9915	3rd Quintile
6	38.90724	-77.0149	3rd Quintile
6	38.90442	-76.995	3rd Quintile
6	38.88274	-76.9962	3rd Quintile
6	38.8794	-76.9883	3rd Quintile
6	38.90566	-76.9978	3rd Quintile
6	38.8932	-76.9962	3rd Quintile
6	38.88612	-76.9808	3rd Quintile
6	38.88127	-76.9823	3rd Quintile
6	38.90115	-76.9938	3rd Quintile
6	38.90133	-76.989	3rd Quintile
6	38.91157	-77.017	3rd Quintile
6	38.88412	-76.9811	3rd Quintile
6	38.88637	-76.9938	3rd Quintile
6	38.89359	-76.9973	3rd Quintile
6	38.89478	-76.9832	3rd Quintile
6	38.88416	-76.979	3rd Quintile
6	38.90138	-76.9962	3rd Quintile

6	38.91115	-77.019	3rd Quintile
6	38.87932	-77.002	3rd Quintile
6	38.90253	-76.9982	3rd Quintile
6	38.87938	-76.9903	3rd Quintile
6	38.90003	-76.9835	3rd Quintile
6	38.89416	-76.9915	3rd Quintile
6	38.88685	-76.9938	3rd Quintile
6	38.90662	-76.9994	3rd Quintile
6	38.89094	-76.9843	3rd Quintile
6	38.89291	-76.9915	3rd Quintile
6	38.89545	-76.9995	3rd Quintile
6	38.90564	-77.0009	3rd Quintile
6	38.87841	-76.9855	3rd Quintile
6	38.89429	-76.995	3rd Quintile
6	38.90594	-76.9985	3rd Quintile
6	38.90134	-76.9943	3rd Quintile
6	38.89822	-76.9915	3rd Quintile
6	38.89913	-76.9903	3rd Quintile
6	38.88126	-76.9916	3rd Quintile
6	38.88537	-76.9846	3rd Quintile
6	38.88085	-76.9962	3rd Quintile
6	38.90375	-76.9987	3rd Quintile
6	38.88849	-76.9915	3rd Quintile
6	38.88274	-76.9969	3rd Quintile
6	38.9016	-76.9902	3rd Quintile
6	38.88925	-76.9837	3rd Quintile
6	38.89124	-76.9822	3rd Quintile
6	38.88409	-76.9836	3rd Quintile
6	38.87974	-76.9927	2nd Quintile
6	38.89547	-76.998	2nd Quintile
6	38.89112	-76.9883	2nd Quintile
6	38.88075	-76.995	2nd Quintile
6	38.8876	-76.9866	2nd Quintile
6	38.88651	-76.9822	2nd Quintile
6	38.88515	-76.979	2nd Quintile
6	38.88555	-76.9998	2nd Quintile
6	38.89527	-76.9938	2nd Quintile
6	38.8898	-76.9859	2nd Quintile
6	38.88544	-76.9915	2nd Quintile
6	38.89738	-76.9951	2nd Quintile
6	38.90469	-76.9962	2nd Quintile
6	38.89658	-76.9837	2nd Quintile
6	38.88686	-76.9915	2nd Quintile
6	38.90136	-76.995	2nd Quintile
6	38.89362	-76.9822	2nd Quintile
6	38.9025	-76.9897	2nd Quintile
6	38.89869	-76.9836	2nd Quintile

6	38.89839	-76.9855	2nd Quintile
6	38.88911	-76.9883	2nd Quintile
6	38.9078	-77.02	2nd Quintile
6	38.90133	-76.9902	2nd Quintile
6	38.90375	-76.9969	2nd Quintile
6	38.89607	-76.9938	2nd Quintile
6	38.91429	-77.0189	2nd Quintile
6	38.8803	-76.9811	2nd Quintile
6	38.89614	-76.9925	2nd Quintile
6	38.90654	-77.0137	2nd Quintile
6	38.89359	-76.9963	2nd Quintile
6	38.89887	-76.9938	2nd Quintile
6	38.89358	-76.9959	2nd Quintile
6	38.89613	-76.9912	2nd Quintile
6	38.90252	-76.9941	2nd Quintile
6	38.90448	-77.0199	2nd Quintile
6	38.89954	-76.9883	2nd Quintile
6	38.90185	-76.9938	2nd Quintile
6	38.89973	-76.9915	2nd Quintile
6	38.88566	-76.9987	2nd Quintile
6	38.90378	-76.9935	2nd Quintile
6	38.87843	-76.9995	2nd Quintile
6	38.88617	-76.9872	2nd Quintile
6	38.91397	-77.024	2nd Quintile
6	38.89723	-76.9841	2nd Quintile
6	38.88018	-76.985	2nd Quintile
6	38.8791	-76.9903	2nd Quintile
6	38.88494	-76.9938	2nd Quintile
6	38.88536	-76.9857	2nd Quintile
6	38.8965	-76.9902	2nd Quintile
6	38.89274	-76.9903	2nd Quintile
6	38.8845	-76.9903	2nd Quintile
6	38.89481	-76.9941	2nd Quintile
6	38.89592	-76.9822	2nd Quintile
6	38.88869	-76.9844	2nd Quintile
6	38.88411	-76.9786	2nd Quintile
6	38.89372	-76.9837	2nd Quintile
6	38.89093	-76.9849	2nd Quintile
6	38.88411	-76.9839	2nd Quintile
6	38.8925	-77.0006	2nd Quintile
6	38.88107	-76.9902	2nd Quintile
6	38.89628	-76.9837	2nd Quintile
6	38.89816	-76.9799	2nd Quintile
6	38.88275	-76.9844	2nd Quintile
6	38.89893	-77.0004	2nd Quintile
6	38.8761	-77.0107	2nd Quintile
6	38.88645	-76.9985	2nd Quintile

6	38.88655	-76.9996	2nd Quintile
6	38.88911	-76.9903	2nd Quintile
6	38.88412	-76.9875	2nd Quintile
6	38.88127	-76.9944	2nd Quintile
6	38.89892	-76.9952	2nd Quintile
6	38.90283	-76.9927	2nd Quintile
6	38.88127	-76.9815	2nd Quintile
6	38.89092	-76.9927	2nd Quintile
6	38.89201	-76.9969	2nd Quintile
6	38.88867	-76.9935	2nd Quintile
6	38.89629	-76.9995	2nd Quintile
6	38.88695	-76.9832	2nd Quintile
6	38.87436	-77.0122	2nd Quintile
6	38.88791	-76.9822	2nd Quintile
6	38.91297	-77.02	2nd Quintile
6	38.89358	-76.9947	2nd Quintile
6	38.89842	-76.9938	2nd Quintile
6	38.89082	-76.9938	2nd Quintile
6	38.89892	-76.9943	2nd Quintile
6	38.8852	-76.9883	2nd Quintile
6	38.87873	-76.9822	2nd Quintile
6	38.8793	-76.9933	2nd Quintile
6	38.88869	-76.9988	2nd Quintile
6	38.90648	-77.0141	2nd Quintile
6	38.90809	-77.0158	2nd Quintile
6	38.88537	-76.9837	2nd Quintile
6	38.89682	-76.9962	2nd Quintile
6	38.87841	-76.9836	2nd Quintile
6	38.90505	-76.9956	2nd Quintile
6	38.90007	-76.9915	2nd Quintile
6	38.89016	-76.9915	2nd Quintile
6	38.88869	-76.9972	2nd Quintile
6	38.89479	-76.984	2nd Quintile
6	38.90218	-76.9995	2nd Quintile
6	38.8779	-76.9837	2nd Quintile
6	38.8813	-77.0016	2nd Quintile
6	38.88538	-76.9865	2nd Quintile
6	38.90612	-76.9981	2nd Quintile
6	38.91114	-77.0186	2nd Quintile
6	38.89358	-76.9931	2nd Quintile
6	38.89019	-76.9985	2nd Quintile
6	38.89211	-76.9799	2nd Quintile
6	38.87841	-76.9865	2nd Quintile
6	38.8862	-76.9836	1st Quintile
6	38.89765	-76.9821	1st Quintile
6	38.89275	-76.983	1st Quintile
6	38.88834	-76.9836	1st Quintile

6	38.89072	-76.9924	1st Quintile
6	38.87842	-76.988	1st Quintile
6	38.88604	-76.9938	1st Quintile
6	38.89733	-76.9986	1st Quintile
6	38.88904	-76.9922	1st Quintile
6	38.90032	-76.9883	1st Quintile
6	38.8802	-76.9862	1st Quintile
6	38.88971	-76.9882	1st Quintile
6	38.90038	-76.9938	1st Quintile
6	38.89098	-76.9872	1st Quintile
6	38.88735	-76.9949	1st Quintile
6	38.88405	-76.9822	1st Quintile
6	38.89957	-76.9899	1st Quintile
6	38.88274	-76.9979	1st Quintile
6	38.89547	-76.9949	1st Quintile
6	38.90347	-76.9938	1st Quintile
6	38.88868	-76.9832	1st Quintile
6	38.89422	-76.9995	1st Quintile
6	38.88366	-76.995	1st Quintile
6	38.87841	-77.0012	1st Quintile
6	38.89985	-76.9883	1st Quintile
6	38.88613	-76.9985	1st Quintile
6	38.89547	-76.9825	1st Quintile
6	38.87811	-76.9883	1st Quintile
6	38.89821	-77.0006	1st Quintile
6	38.89359	-76.9968	1st Quintile
6	38.89277	-76.9892	1st Quintile
6	38.88981	-76.9806	1st Quintile
6	38.87756	-77.0012	1st Quintile
6	38.88715	-77.002	1st Quintile
6	38.89869	-76.9828	1st Quintile
6	38.88547	-76.9883	1st Quintile
6	38.87641	-77.0115	1st Quintile
6	38.88128	-76.9828	1st Quintile
6	38.90252	-76.9909	1st Quintile
6	38.88569	-76.9903	1st Quintile
6	38.90031	-76.9855	1st Quintile
6	38.892	-76.9977	1st Quintile
6	38.90188	-76.9882	1st Quintile
6	38.90023	-76.9925	1st Quintile
6	38.89452	-77.002	1st Quintile
6	38.8876	-76.9975	1st Quintile
6	38.89548	-76.9834	1st Quintile
6	38.89487	-76.9773	1st Quintile
6	38.87966	-77.0006	1st Quintile
6	38.8973	-76.9855	1st Quintile
6	38.89734	-76.997	1st Quintile

6	38.90252	-76.9936	1st Quintile
6	38.91409	-77.0261	1st Quintile
6	38.89945	-77.0035	1st Quintile
7	38.90639	-76.9415	5th Quintile
7	38.89007	-76.9329	5th Quintile
7	38.89177	-76.926	5th Quintile
7	38.90491	-76.937	5th Quintile
7	38.86474	-76.9471	5th Quintile
7	38.912	-76.9367	5th Quintile
7	38.90424	-76.9388	5th Quintile
7	38.90549	-76.9371	5th Quintile
7	38.89724	-76.9261	5th Quintile
7	38.90483	-76.9461	5th Quintile
7	38.86468	-76.9457	5th Quintile
7	38.90723	-76.9413	5th Quintile
7	38.89648	-76.9273	5th Quintile
7	38.90597	-76.9327	5th Quintile
7	38.90913	-76.9327	5th Quintile
7	38.89025	-76.9602	5th Quintile
7	38.86952	-76.9426	5th Quintile
7	38.89716	-76.9192	5th Quintile
7	38.89279	-76.9291	5th Quintile
7	38.8984	-76.9425	5th Quintile
7	38.87756	-76.9647	5th Quintile
7	38.91007	-76.9376	5th Quintile
7	38.91266	-76.9394	5th Quintile
7	38.8955	-76.9178	5th Quintile
7	38.88458	-76.9575	5th Quintile
7	38.90602	-76.9286	5th Quintile
7	38.89198	-76.9349	5th Quintile
7	38.89659	-76.9269	5th Quintile
7	38.89661	-76.9281	5th Quintile
7	38.90593	-76.9419	5th Quintile
7	38.90465	-76.9454	5th Quintile
7	38.86743	-76.9426	5th Quintile
7	38.90402	-76.9455	5th Quintile
7	38.9046	-76.9458	5th Quintile
7	38.90909	-76.9354	5th Quintile
7	38.90722	-76.9402	5th Quintile
7	38.90371	-76.945	5th Quintile
7	38.88504	-76.9575	5th Quintile
7	38.90665	-76.9439	5th Quintile
7	38.89543	-76.9575	5th Quintile
7	38.91042	-76.9387	5th Quintile
7	38.89369	-76.93	5th Quintile
7	38.90706	-76.9431	5th Quintile
7	38.90928	-76.9357	5th Quintile

7	38.90733	-76.9428	5th Quintile
7	38.89872	-76.9486	5th Quintile
7	38.90562	-76.9422	5th Quintile
7	38.90808	-76.9425	5th Quintile
7	38.91117	-76.9328	5th Quintile
7	38.90365	-76.9338	5th Quintile
7	38.90463	-76.9417	5th Quintile
7	38.91107	-76.9407	5th Quintile
7	38.90637	-76.9427	5th Quintile
7	38.90466	-76.944	5th Quintile
7	38.90563	-76.9443	5th Quintile
7	38.90607	-76.928	5th Quintile
7	38.90562	-76.9413	5th Quintile
7	38.9117	-76.9362	5th Quintile
7	38.90944	-76.935	5th Quintile
7	38.90865	-76.9422	5th Quintile
7	38.91146	-76.9357	5th Quintile
7	38.90563	-76.9426	5th Quintile
7	38.9056	-76.9407	5th Quintile
7	38.89201	-76.9581	5th Quintile
7	38.89678	-76.9379	5th Quintile
7	38.89148	-76.9349	5th Quintile
7	38.90638	-76.9412	5th Quintile
7	38.90857	-76.9417	5th Quintile
7	38.89051	-76.9178	5th Quintile
7	38.90563	-76.9434	5th Quintile
7	38.90374	-76.9435	5th Quintile
7	38.90725	-76.9391	5th Quintile
7	38.90703	-76.9419	5th Quintile
7	38.90416	-76.9434	5th Quintile
7	38.90469	-76.9434	5th Quintile
7	38.8997	-76.9308	5th Quintile
7	38.89887	-76.9317	5th Quintile
7	38.89368	-76.9272	5th Quintile
7	38.90723	-76.9422	5th Quintile
7	38.89415	-76.921	5th Quintile
7	38.90702	-76.9317	5th Quintile
7	38.9015	-76.9389	5th Quintile
7	38.90374	-76.9426	4th Quintile
7	38.9078	-76.9344	4th Quintile
7	38.90994	-76.9371	4th Quintile
7	38.89318	-76.929	4th Quintile
7	38.8645	-76.9473	4th Quintile
7	38.89752	-76.9397	4th Quintile
7	38.89838	-76.9419	4th Quintile
7	38.89262	-76.9178	4th Quintile
7	38.90438	-76.9346	4th Quintile

7	38.89666	-76.915	4th Quintile
7	38.89201	-76.9585	4th Quintile
7	38.88498	-76.9284	4th Quintile
7	38.89513	-76.9251	4th Quintile
7	38.89161	-76.9602	4th Quintile
7	38.90256	-76.9356	4th Quintile
7	38.90388	-76.9235	4th Quintile
7	38.86446	-76.9545	4th Quintile
7	38.90067	-76.935	4th Quintile
7	38.89753	-76.9425	4th Quintile
7	38.8919	-76.9354	4th Quintile
7	38.89348	-76.934	4th Quintile
7	38.87595	-76.9349	4th Quintile
7	38.89067	-76.9526	4th Quintile
7	38.90608	-76.9352	4th Quintile
7	38.90334	-76.9433	4th Quintile
7	38.91184	-76.9388	4th Quintile
7	38.89752	-76.9406	4th Quintile
7	38.89755	-76.9699	4th Quintile
7	38.90132	-76.9229	4th Quintile
7	38.9032	-76.9377	4th Quintile
7	38.89358	-76.9566	4th Quintile
7	38.88573	-76.944	4th Quintile
7	38.86801	-76.9658	4th Quintile
7	38.87624	-76.935	4th Quintile
7	38.88821	-76.9267	4th Quintile
7	38.90215	-76.9366	4th Quintile
7	38.87482	-76.9349	4th Quintile
7	38.89404	-76.933	4th Quintile
7	38.89839	-76.9444	4th Quintile
7	38.90549	-76.9327	4th Quintile
7	38.9072	-76.9286	4th Quintile
7	38.8807	-76.9436	4th Quintile
7	38.87841	-76.9362	4th Quintile
7	38.9011	-76.9282	4th Quintile
7	38.89347	-76.9257	4th Quintile
7	38.89756	-76.9259	4th Quintile
7	38.89572	-76.932	4th Quintile
7	38.89754	-76.942	4th Quintile
7	38.89081	-76.9602	4th Quintile
7	38.89357	-76.9123	4th Quintile
7	38.89267	-76.9204	4th Quintile
7	38.89831	-76.9491	4th Quintile
7	38.8956	-76.9572	4th Quintile
7	38.8855	-76.9575	4th Quintile
7	38.88432	-76.9434	4th Quintile
7	38.90467	-76.9373	3rd Quintile

7	38.8935	-76.9575	3rd Quintile
7	38.8697	-76.9578	3rd Quintile
7	38.89927	-76.9219	3rd Quintile
7	38.88571	-76.9436	3rd Quintile
7	38.9015	-76.9372	3rd Quintile
7	38.91149	-76.9332	3rd Quintile
7	38.89354	-76.9253	3rd Quintile
7	38.88314	-76.9387	3rd Quintile
7	38.9003	-76.921	3rd Quintile
7	38.90491	-76.9275	3rd Quintile
7	38.89142	-76.9531	3rd Quintile
7	38.90347	-76.9317	3rd Quintile
7	38.89559	-76.9205	3rd Quintile
7	38.87944	-76.939	3rd Quintile
7	38.89627	-76.9304	3rd Quintile
7	38.87385	-76.9718	3rd Quintile
7	38.88344	-76.9429	3rd Quintile
7	38.889	-76.9321	3rd Quintile
7	38.89226	-76.9713	3rd Quintile
7	38.89907	-76.9423	3rd Quintile
7	38.90465	-76.9387	3rd Quintile
7	38.88441	-76.9572	3rd Quintile
7	38.90606	-76.9322	3rd Quintile
7	38.9015	-76.9382	3rd Quintile
7	38.89442	-76.9137	3rd Quintile
7	38.90209	-76.9376	3rd Quintile
7	38.8932	-76.9575	3rd Quintile
7	38.8653	-76.9458	3rd Quintile
7	38.90151	-76.9365	3rd Quintile
7	38.89848	-76.9178	3rd Quintile
7	38.89581	-76.9151	3rd Quintile
7	38.89752	-76.9401	3rd Quintile
7	38.88284	-76.9618	3rd Quintile
7	38.89783	-76.9496	3rd Quintile
7	38.9022	-76.9392	3rd Quintile
7	38.90154	-76.9356	3rd Quintile
7	38.89941	-76.9362	3rd Quintile
7	38.87724	-76.9355	3rd Quintile
7	38.89839	-76.9453	3rd Quintile
7	38.86312	-76.9615	3rd Quintile
7	38.90373	-76.9354	3rd Quintile
7	38.8888	-76.9542	3rd Quintile
7	38.89723	-76.9471	3rd Quintile
7	38.89531	-76.9549	3rd Quintile
7	38.89308	-76.9517	3rd Quintile
7	38.88285	-76.9603	2nd Quintile
7	38.90468	-76.9351	2nd Quintile

7	38.88576	-76.9186	2nd Quintile
7	38.88473	-76.9437	2nd Quintile
7	38.89911	-76.9244	2nd Quintile
7	38.90185	-76.9285	2nd Quintile
7	38.89112	-76.9349	2nd Quintile
7	38.88166	-76.9242	2nd Quintile
7	38.88285	-76.9592	2nd Quintile
7	38.88485	-76.9423	2nd Quintile
7	38.90937	-76.9324	2nd Quintile
7	38.88381	-76.9414	2nd Quintile
7	38.89975	-76.9346	2nd Quintile
7	38.89277	-76.9519	2nd Quintile
7	38.89974	-76.9391	2nd Quintile
7	38.90033	-76.9387	2nd Quintile
7	38.89078	-76.9513	2nd Quintile
7	38.89783	-76.9723	2nd Quintile
7	38.89519	-76.9363	2nd Quintile
7	38.90237	-76.9347	2nd Quintile
7	38.89731	-76.9358	2nd Quintile
7	38.89678	-76.9391	2nd Quintile
7	38.89291	-76.9143	2nd Quintile
7	38.8929	-76.9121	2nd Quintile
7	38.90434	-76.9354	2nd Quintile
7	38.905	-76.9263	2nd Quintile
7	38.86733	-76.9623	2nd Quintile
7	38.89425	-76.9252	2nd Quintile
7	38.87916	-76.9421	2nd Quintile
7	38.87374	-76.9715	2nd Quintile
7	38.87807	-76.936	2nd Quintile
7	38.90332	-76.939	2nd Quintile
7	38.89317	-76.9371	2nd Quintile
7	38.89729	-76.9219	2nd Quintile
7	38.90281	-76.9337	2nd Quintile
7	38.90141	-76.9234	2nd Quintile
7	38.89892	-76.9178	2nd Quintile
7	38.90608	-76.937	2nd Quintile
7	38.87868	-76.9424	2nd Quintile
7	38.89615	-76.9333	2nd Quintile
7	38.88348	-76.9264	2nd Quintile
7	38.86191	-76.9605	2nd Quintile
7	38.87716	-76.9636	2nd Quintile
7	38.86458	-76.9624	2nd Quintile
7	38.88643	-76.9235	2nd Quintile
7	38.90368	-76.9346	2nd Quintile
7	38.87696	-76.9398	2nd Quintile
7	38.89909	-76.9351	2nd Quintile
7	38.8934	-76.9444	2nd Quintile

7	38.8694	-76.953	2nd Quintile
7	38.90512	-76.9384	2nd Quintile
7	38.88581	-76.924	2nd Quintile
7	38.89482	-76.9269	2nd Quintile
7	38.88736	-76.9255	2nd Quintile
7	38.9003	-76.9285	2nd Quintile
7	38.89795	-76.9192	2nd Quintile
7	38.90154	-76.9376	2nd Quintile
7	38.89835	-76.923	2nd Quintile
7	38.89837	-76.9392	2nd Quintile
7	38.8959	-76.9205	2nd Quintile
7	38.89123	-76.919	2nd Quintile
7	38.89678	-76.9394	2nd Quintile
7	38.87486	-76.9681	2nd Quintile
7	38.89833	-76.9263	2nd Quintile
7	38.90179	-76.9347	2nd Quintile
7	38.89046	-76.9327	2nd Quintile
7	38.89395	-76.9219	2nd Quintile
7	38.90722	-76.9294	2nd Quintile
7	38.89306	-76.9361	2nd Quintile
7	38.86939	-76.9678	2nd Quintile
7	38.87405	-76.9722	2nd Quintile
7	38.8932	-76.9123	2nd Quintile
7	38.85882	-76.9602	1st Quintile
7	38.89838	-76.9413	1st Quintile
7	38.89998	-76.9307	1st Quintile
7	38.9036	-76.9297	1st Quintile
7	38.88728	-76.9233	1st Quintile
7	38.90151	-76.94	1st Quintile
7	38.89838	-76.9403	1st Quintile
7	38.86082	-76.9576	1st Quintile
7	38.89345	-76.9393	1st Quintile
7	38.87963	-76.9452	1st Quintile
7	38.86203	-76.9576	1st Quintile
7	38.90606	-76.9317	1st Quintile
7	38.86196	-76.9591	1st Quintile
7	38.86416	-76.9475	1st Quintile
7	38.89236	-76.9358	1st Quintile
7	38.89705	-76.9304	1st Quintile
7	38.89307	-76.9212	1st Quintile
7	38.87439	-76.9697	1st Quintile
7	38.86845	-76.942	1st Quintile
7	38.87042	-76.945	1st Quintile
7	38.87098	-76.9512	1st Quintile
7	38.89079	-76.9302	1st Quintile
7	38.89081	-76.9328	1st Quintile
7	38.90533	-76.9253	1st Quintile

7	38.88838	-76.9276	1st Quintile
7	38.89959	-76.9315	1st Quintile
7	38.89221	-76.9292	1st Quintile
7	38.89425	-76.9219	1st Quintile
7	38.89753	-76.9192	1st Quintile
7	38.86653	-76.9476	1st Quintile
7	38.89384	-76.9164	1st Quintile
7	38.8765	-76.9324	1st Quintile
7	38.89291	-76.9137	1st Quintile
7	38.89356	-76.9264	1st Quintile
7	38.89255	-76.9368	1st Quintile
7	38.89483	-76.9391	1st Quintile
7	38.89747	-76.9377	1st Quintile
7	38.86227	-76.9605	1st Quintile
7	38.89547	-76.9267	1st Quintile
7	38.86925	-76.9409	1st Quintile
7	38.89638	-76.915	1st Quintile
7	38.89651	-76.9265	1st Quintile
7	38.89735	-76.9759	1st Quintile
7	38.89356	-76.9289	1st Quintile
7	38.8941	-76.9295	1st Quintile
7	38.89598	-76.9164	1st Quintile
7	38.87463	-76.9647	1st Quintile
7	38.89716	-76.9167	1st Quintile
7	38.89614	-76.9321	1st Quintile
7	38.86911	-76.9416	1st Quintile
7	38.87868	-76.9382	1st Quintile
7	38.86867	-76.9678	1st Quintile
7	38.8603	-76.9575	1st Quintile
7	38.86281	-76.9592	1st Quintile
8	38.83989	-77.0058	5th Quintile
8	38.84493	-77.0081	5th Quintile
8	38.84759	-76.9989	5th Quintile
8	38.87324	-76.9739	5th Quintile
8	38.86427	-76.9812	5th Quintile
8	38.86428	-76.9869	5th Quintile
8	38.86694	-76.9839	5th Quintile
8	38.84116	-77.0058	5th Quintile
8	38.82613	-76.9974	5th Quintile
8	38.86029	-76.989	5th Quintile
8	38.86537	-76.9823	5th Quintile
8	38.82952	-77.0077	5th Quintile
8	38.86513	-76.9811	5th Quintile
8	38.87137	-76.9749	5th Quintile
8	38.87277	-76.9747	5th Quintile
8	38.8648	-76.9857	5th Quintile
8	38.84118	-76.99	5th Quintile

8	38.82398	-76.9981	5th Quintile
8	38.86449	-76.9824	5th Quintile
8	38.84088	-77.0052	5th Quintile
8	38.86949	-76.9725	5th Quintile
8	38.82364	-77.0117	5th Quintile
8	38.86475	-76.9799	4th Quintile
8	38.87197	-76.9738	4th Quintile
8	38.83037	-76.9934	4th Quintile
8	38.844	-76.9722	4th Quintile
8	38.83121	-77.0061	4th Quintile
8	38.86579	-76.9855	4th Quintile
8	38.86452	-76.9876	4th Quintile
8	38.84396	-77.0082	4th Quintile
8	38.82701	-77.0093	4th Quintile
8	38.84779	-76.9992	4th Quintile
8	38.86445	-76.9872	4th Quintile
8	38.82923	-77.0001	4th Quintile
8	38.86575	-76.9821	4th Quintile
8	38.87175	-76.9742	4th Quintile
8	38.86054	-76.986	4th Quintile
8	38.84079	-76.9911	4th Quintile
8	38.86723	-76.9703	4th Quintile
8	38.82919	-76.9951	4th Quintile
8	38.86506	-76.9807	4th Quintile
8	38.827	-77.0089	4th Quintile
8	38.83147	-76.9901	4th Quintile
8	38.827	-77.0113	4th Quintile
8	38.86824	-76.985	4th Quintile
8	38.86638	-76.9879	4th Quintile
8	38.86505	-76.9798	4th Quintile
8	38.86605	-76.982	4th Quintile
8	38.84403	-77.0015	4th Quintile
8	38.86385	-76.988	4th Quintile
8	38.86455	-76.9828	4th Quintile
8	38.86947	-76.9818	4th Quintile
8	38.85569	-76.9875	4th Quintile
8	38.86619	-76.9869	4th Quintile
8	38.86427	-76.9862	3rd Quintile
8	38.87027	-76.979	3rd Quintile
8	38.86503	-76.9855	3rd Quintile
8	38.8404	-76.9936	3rd Quintile
8	38.84575	-76.9797	3rd Quintile
8	38.86644	-76.9882	3rd Quintile
8	38.86728	-76.9829	3rd Quintile
8	38.87194	-76.9774	3rd Quintile
8	38.86382	-76.9838	3rd Quintile
8	38.86436	-76.9859	3rd Quintile

8	38.87218	-76.975	3rd Quintile
8	38.86884	-76.98	3rd Quintile
8	38.86413	-76.9879	3rd Quintile
8	38.86625	-76.9872	3rd Quintile
8	38.86465	-76.9835	3rd Quintile
8	38.84671	-76.9802	3rd Quintile
8	38.83946	-76.9948	3rd Quintile
8	38.8278	-77.0119	3rd Quintile
8	38.83095	-77.0009	3rd Quintile
8	38.86376	-76.9834	3rd Quintile
8	38.83935	-76.9955	2nd Quintile
8	38.86949	-76.9769	2nd Quintile
8	38.86382	-76.9889	2nd Quintile
8	38.85524	-76.9879	2nd Quintile
8	38.86377	-76.9827	2nd Quintile
8	38.86536	-76.9797	2nd Quintile
8	38.86575	-76.9767	2nd Quintile
8	38.8292	-76.9932	2nd Quintile
8	38.85015	-76.9743	2nd Quintile
8	38.82622	-76.9979	2nd Quintile
8	38.87077	-76.9738	2nd Quintile
8	38.86483	-76.9774	2nd Quintile
8	38.84014	-77.0062	2nd Quintile
8	38.86096	-76.9937	2nd Quintile
8	38.86654	-76.9838	2nd Quintile
8	38.86867	-76.9803	2nd Quintile
8	38.87063	-76.9799	2nd Quintile
8	38.84605	-76.9834	2nd Quintile
8	38.83009	-76.9959	2nd Quintile
8	38.82507	-76.9965	2nd Quintile
8	38.8229	-76.9992	2nd Quintile
8	38.87261	-76.9722	2nd Quintile
8	38.83126	-77.0065	2nd Quintile
8	38.87007	-76.9775	2nd Quintile
8	38.84401	-76.9906	2nd Quintile
8	38.82441	-77.0103	2nd Quintile
8	38.82791	-76.9985	2nd Quintile
8	38.87143	-76.9774	2nd Quintile
8	38.84184	-77.0045	2nd Quintile
8	38.86316	-76.9728	2nd Quintile
8	38.84474	-77.0086	2nd Quintile
8	38.84359	-76.9776	2nd Quintile
8	38.86845	-76.9809	2nd Quintile
8	38.869	-76.9822	1st Quintile
8	38.82712	-76.9985	1st Quintile
8	38.85715	-76.9934	1st Quintile
8	38.8673	-76.9808	1st Quintile

8	38.82946	-76.9985	1st Quintile
8	38.84249	-76.9885	1st Quintile
8	38.82922	-76.9965	1st Quintile
8	38.84873	-77.0009	1st Quintile
8	38.84367	-76.9773	1st Quintile
8	38.84125	-77.0036	1st Quintile
8	38.87254	-76.975	1st Quintile
8	38.87068	-76.9822	1st Quintile
8	38.8719	-76.975	1st Quintile
8	38.86052	-76.9936	1st Quintile
8	38.84402	-76.9995	1st Quintile
8	38.8533	-76.9732	1st Quintile
8	38.83953	-77.0051	1st Quintile
8	38.86947	-76.9822	1st Quintile
8	38.84614	-76.9959	1st Quintile
8	38.84376	-76.9894	1st Quintile
8	38.83997	-76.9937	1st Quintile
8	38.8635	-76.9704	1st Quintile
8	38.86956	-76.9787	1st Quintile
8	38.84498	-76.9709	1st Quintile
8	38.8288	-77.0094	1st Quintile
8	38.86511	-76.9708	1st Quintile
8	38.8701	-76.9731	1st Quintile
8	38.83128	-77.0075	1st Quintile
8	38.82608	-77.0124	1st Quintile
8	38.85009	-76.966	1st Quintile
8	38.82583	-76.9987	1st Quintile
8	38.87074	-76.9732	1st Quintile
8	38.86594	-76.9703	1st Quintile
8	38.84671	-76.9772	1st Quintile
8	38.84436	-76.9846	1st Quintile
8	38.82701	-77.0097	1st Quintile
8	38.84407	-76.9947	1st Quintile
8	38.84076	-77.0049	1st Quintile
8	38.84491	-77.0065	1st Quintile
8	38.8301	-76.998	1st Quintile
8	38.8696	-76.979	1st Quintile
8	38.86276	-76.9721	1st Quintile
8	38.87035	-76.977	1st Quintile
8	38.83685	-77.007	1st Quintile
8	38.87075	-76.971	1st Quintile
8	38.86947	-76.971	1st Quintile
8	38.82502	-76.9985	1st Quintile
8	38.84224	-76.994	1st Quintile
8	38.82519	-77.0091	1st Quintile
8	38.84287	-76.98	1st Quintile
8	38.84429	-76.9966	1st Quintile

8	38.827	-77.0106	1st Quintile
8	38.84887	-76.981	1st Quintile

CERTIFICATE OF SERVICE

I hereby certify that on this 30th day of November 2021, I caused true and correct copies of the 2021 Fugitive Methane Emission Survey of the District of Columbia, to be emailed to the following:

Christopher Lipscombe
General Counsel
Public Service Commission
1325 G Street, N.W.
Suite No. 800
Washington, D.C. 20005
LWalt@psc.dc.gov

Sarah Kogel-Smucker
Assistant People's Counsel
Office of the People's Counsel
1133 15th Street, N.W.
Suite 500
Washington, D.C. 20005
ssmucker@opc-dc.gov

Cathy Thurston-Seignious
Washington Gas Light Company
1000 Maine Ave. SW
Washington, D.C. 20024
cthurston-seignious@washgas.com

Dennis Jamouneau
Potomac Electric Power Company
701 9th Street, NW
Suite 1100, 10th Floor
Washington, D.C. 20068
djamouneau@pepcoholdings.com

Barbara Mitchell
D.C. Water
5000 Overlook Ave. SW
Washington, D.C. 20032
Barbara.mitchell@dcwater.com

Nina Dodge
DC Climate Action
6004 34th Place N.W.
Washington, D.C. 20015
ndodge342@gmail.com

Kevin Auerbacher
Tesla, Inc.
1050 K Street, N.W., Suite 101
Washington, D.C. 20001
kauerbacher@tesla.com

Meena Gowda
D.C. Water and Sewer Authority
5000 Overlook Ave. S.W.
Washington, D.C. 20032
meena.gowda@dcwater.com

Frann G. Francis
Apartment and Office Building Assoc.
1025 Connecticut Avenue NW, Ste. 1005
Washington, DC 20036
Ffrancis@aoba-metro.org

Erin Murphy
Environmental Defense Fund
1875 Connecticut Ave. NW Ste. 600
Washington, DC 20009
emurphy@edf.org

Brian J. Petruska, Esq.
LIUNA Mid-Atlantic Region 11951
Freedom Drive, Suite 310
Reston, VA 20190
bpetruska@maliuma.org

Susan Stevens-Miller, Esq.
Earthjustice
1625 Massachusetts Ave. N.W., Ste 702
Washington, DC 20036
smiller@earthjustice.org

/s/ Brian Caldwell
Brian Caldwell

CERTIFICATE OF SERVICE

I hereby certify that on this 2nd day of May 2023, I caused true and correct copies of the foregoing Initial Comments of the Department of Energy and Environment on WGL's Pipes 3 Application to be electronically delivered to the following:

Cathy Thurston-Seignious, Esq.
Washington Gas Light Company
101 Constitution Avenue, N.W.
Third Floor West
Washington, D.C. 20010
Cthurston-seignious@washgas.com

Frann G. Francis, Esq.
Apartment and Office Building
Association of Metropolitan Washington
1025 Connecticut Avenue, N.W., Suite 1005
Washington, D.C. 20036
ffrancis@aoba-metro.org

Ankush Nayar, Esq.
Office of the People's Counsel
655 15th Street, N.W., Suite 200
Washington, D.C. 20005
anayar@opc-dc.gov

Christopher Lipscombe, Esq.
D.C. Public Service Commission
1325 G Street, N.W., Suite 800
Washington, D.C. 20005
clipscombe@psc.dc.gov

Timothy R. Oberleiton, Esq.
Earthjustice
1001 G St. NW, Ste. 1000
Washington, D.C. 20001
(202) 667-4500
toberleiton@earthjustice.org

/s/ Brian R. Caldwell
Brian R. Caldwell